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The
**PENNSYLVANIA DAIRYMEN'S
ASSOCIATION**

Organized 1925

Succeeding the Following Organizations:

The Crawford County Dairy Association (1871)

The Pennsylvania Dairy Association (1874)

The Pennsylvania Dairy Union (1898)

The Pennsylvania Livestock Breeders' and Dairymen's Assn. (1916)

REPORT
of
THIRD ANNUAL MEETING
January 18th, 1928
HARRISBURG, PA.

FIRST ANNUAL SPRING MEETING
May 6th, 1927
STATE COLLEGE, PA.

E. B. FITTS, President, State College, Pa.
ROBERT F. BRINTON, Secretary-Treasurer, West Chester, Pa.

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The Dairy Industry in Pennsylvania During 1927

E. B. FIRTS,

President, Pennsylvania Dairymen's Association

In extending greetings at this, the third annual meeting of the Pennsylvania Dairymen's Association I shall endeavor to briefly review the work of the past year and to comment somewhat on some phases of the dairy industry as it exists within our state.

The association has been active during 1927. It has used its influence toward the enactment of desirable legislation, it has sponsored improvement work of various kinds, it has encouraged constructive cooperative marketing, it has given active support to the Pennsylvania Department of Agriculture in its program of disease elimination from the herds of our state and has participated in other activities.

In addition to the annual meeting held in Harrisburg last year a summer meeting was held at State College in May. A constructive program was presented and 400 or more dairymen, mostly from the central part of the state, were in attendance. The papers delivered at this meeting have been preserved and may be printed in the forthcoming annual report.

The membership, now approximating 400, includes men in all branches of the industry. There has been a marked increase in membership during the year and the affairs of the association are in good condition.

IMPORTANCE OF THE INDUSTRY

Dairying in Pennsylvania is an industry of primary importance. It provides the main source of income on more than half the farms of the state, and is an important source of income on most of those remaining. Although generally known as a manufacturing and industrial state yet Pennsylvania is a leader among the states as a great milk producing center ranking fourth in volume of milk produced.

The farm value of the dairy products produced in Pennsylvania is not far from \$100,000,000. If one is to get a true picture of the total value of the industry to the state there must be added to this sum the increased values given the product through transportation, processing, manufacturing, and distribution. Then, too, there is the business of transporting, processing, manufacturing and distributing the enormous quantity of dairy products brought into our state from outside sources. This volume is far in excess of that produced within the state. A conservative estimate of the sale value of all dairy products

consumed in Pennsylvania is not less than \$250,000,000 which sum would seem to justify a statement that the industry is one of first magnitude.

Dairying in all its phases has a marked stabilizing influence in that it provides employment for many thousands of persons in all sections of our state, provides the best available market for general farm crops, produces a product for which there is a ready home market and finally contains possibilities for profits in all its phases for those who follow good business practices.

PRESENT STATUS OF THE INDUSTRY

Within the state the condition of the industry has been good. Due largely to a favorable season production has been fully maintained or increased and prices were fairly satisfactory. For several years there has been a swing from butter and cheese making toward the production of market milk and this trend continued during the year with several new districts establishing direct connections with city milk markets. This tendency seems likely to continue until practically all milk produced in the state finds its way to the consumer in fluid form.

In manufacturing and distribution new capital has been invested, improved methods adopted and a feeling of optimism seems to prevail. A general survey of the status of the industry would seem to justify the statement that it is entirely solvent with a large excess of assets over liabilities.

PRODUCTION AND CONSUMPTION COMPARED

The estimated number of milk cows in Pennsylvania on January 1, 1927 was 845,000 and the average production 4500 pounds of milk per cow or a total production of 3,802,500,000 pounds of milk. On the same date the estimated population of our state was 9,613,570. The National Dairy Council estimate the average annual consumption of milk in all its forms at 1040 pounds per capita. Using this factor we find there is in the state a total consumption of milk of 9,998,112,800 pounds or 6,195,612,800 in excess of that produced. To produce this amount of milk within the state would require the work of 1,376,803 additional average cows or an increase of 163 per cent in our dairy cow population. Thus we see why Pennsylvania is a very large importer of milk. Most of these imports come in the form of cream, butter, cheese, powdered or condensed milk although our neighboring states of New Jersey, Maryland, Delaware, Ohio and West Virginia are very large contributors to the milk supply of Philadelphia and Pittsburgh. This importation is, however, partly balanced, at least, by shipments of milk from some of our northern counties to New York City.

CHANGES IN DAIRY COW POPULATION AND PRODUCTION

Recent years have shown a gradual decline in the number of cows in Pennsylvania. There has been an increase in the amount of milk produced per cow, however, so that the total milk production has been somewhat greater.

The following table from federal and state census reports shows the trend in both cow population and in production. Figures are of January 1. The average production of 1927 is estimated:

Year	Number Milking Cows	Average Milk per cow in lbs.	Total Milk produc'n lbs.
1927	845,000	4500	3,802,500,000
1920	885,855	3990	3,534,561,450
	Decrease 40,855	Increase 510	Increase 267,938,550

Comparing 1927 with 1920 it is thus seen that from 40,855 fewer cows or a decrease of 4.6 per cent there was an increased production of 267,938,550 pounds of milk or about 7.6 per cent. This indicates a healthy trend and points the way toward a better condition in the production side of the industry.

PURE BRED CATTLE

The source of improvement in the milk production or working ability of dairy cattle lies in the strains of high milk producing stimulus existing within the several breeds of pure bred dairy cattle. Figures from the United States Department of Agriculture, based on records of thousands of cows in cow testing associations, indicate that the average pure bred cow produces 668 pounds more milk annually than a grade when kept under similar conditions of feed and care and that the grade cow, owing to her pure bred inheritance, leads the scrub cow by a much larger margin.

Pennsylvania ranks third among the states in total number of pure bred dairy cattle and breeders from many sections of our country look to this state as a reliable source of good foundation animals for dairy improvement purposes.

There are in Pennsylvania, three state, three district and 55 county dairy cattle breeders associations each with a more or less definite program of work seeking to still further improve the quality or working ability of their respective breed and to make known its merits to dairymen generally. During the year just past there has been apparent a growing realization of the value of pure bred cattle as reflected in prices realized at sales.

DISEASE CONTROL

The producing side of the industry is handicapped by the widespread existence among the herds of the state of contagious diseases, the more destructive of which are bovine tuberculosis and contagious abortion.

BOVINE TUBERCULOSIS—The state of Pennsylvania in co-operation with the United States Department of Agriculture has long been engaged in a war on bovine tuberculosis. This work proceeds under what is known as the Individual Accredited Herd plan and the Area Test plan. Under the latter plan all animals in definite areas are tested and the entire area finally accredited in a modified way. Very gratifying progress has been made and the past year has been one of especial activity. Our Bureau of Animal Industry reported on December 1, 1927, a total of 103,715 herds comprising 724,544 cattle as tested once or more and under supervision.

The following information relative to area testing in the state as supplied by the Bureau will be of interest:

11 modified accredited counties	5 counties 50% area tested
8 additional counties completely tested (not yet accredited)	10 counties 25% area tested
	17 counties 5% area tested
	2 counties partly qualified
6 counties 75% area tested	8 counties no activity

A comparison of the number of herds and cattle tested during the first eight months in 1927 with a similar period in 1926 shows an increase of 14,153 herds comprising 133,948 cattle.

It would appear from the above report that the end of the battle is in sight and that the Bureau of Animal Industry and cooperating agencies merit the full support and commendation of this association.

ABORTION—This disease with its apparent companion troubles of sterility and delayed breeding takes an enormous toll each year from the dairy herds of our state through a decreased production of milk. Scientific investigation has revealed a dependable means of detecting the disease through a simple blood test. Patient study and careful observation has made possible the working out of a practical plan, based on this blood test, for eliminating the disease from the herd.

The Bureau of Animal Industry offers valuable service to the dairy industry in the eradication of this disease. Considerable progress is being made as indicated by a report from the Bureau showing 7,000 animals tested in 1924, 13,000 in 1925, 19,000 in 1926 and 25,000 in 1927. Under the Bureau plan the disease has been completely eliminated from 49 herds which have

received abortion free certificates. More than 200 additional herds have signed up under the plan. It would appear that the way now seems open for eliminating the disease and gradually building up in the state disease free herds of cattle. This is a fact of great importance to the industry.

PRODUCTION IMPROVEMENT AGENCIES

Many agencies exist other than already mentioned which have as their object the betterment of the industry throughout the state. The more important of these are perhaps the Cow Testing Association, the Bull Association and Boys' and Girls' Calf Clubs. Since the objects and mode of procedure of these organized activities are generally understood our remarks regarding them will be confined to progress made during the year.

COW TESTING ASSOCIATIONS—In cow testing there has been an increase in number of associations from 50 on January 1, 1927 to 67 on January 1, 1928. These 67 associations comprise 1600 members owning about 25,000 cows. The average milk production of these cows in 1927 was very nearly 8000 pounds or 3500 pounds greater than the production of the average cow of the state. Experience has shown that the benefits of association work are not limited to the membership but that association methods in dairying gradually extend through the community in which the association operates. Thus each new association organized becomes a potent factor for progress and improvement. An average of 300 pounds of butterfat per cow is a goal in association herds. In order to encourage interest in association work and to provide a reward for exceptional accomplishment the Pennsylvania Dairymen's Association at its annual meeting in 1926 offered a prize ribbon to each dairyman whose herd average in butterfat production during the previous year reached or exceeded 300 pounds or the association goal. In that year 301 ribbons were awarded. The practice was continued in 1927 when 377 ribbon honors were conferred. This year at your banquet, there will be awarded 541 ribbons, an increase of 164 over the previous year.

In order to stimulate continued interest in this contest the ribbons are awarded in three colors; a red ribbon to herds with an average production of 300 to 350 pounds of butterfat, a blue ribbon to herds with an average of 350 to 400 pounds butterfat and a purple ribbon to all herds averaging 400 or more pounds. The following table shows comparisons by years.

	1926	1927	1928	Per cent gain over '26
Purple Ribbons	18	35	54	200
Blue Ribbons	73	96	148	103
Red Ribbons	210	246	340	62
	<hr/> 301	<hr/> 377	<hr/> 542	

I believe the awarding of these ribbons to be a constructive association activity and recommend its continuance.

BULL ASSOCIATIONS—In bull associations Pennsylvania leads all states in the Union having a wide margin over its nearest competitor. On January 1, there were 63 associations in operation which is a gain of 16 over the previous year. These associations have 820 members owning 229 bulls which are being bred to approximately 10,000 cows. Twenty-five counties have one or more associations, Butler county leading with nine. The bulls are all very carefully selected for both type and productive inheritance. Results thus far secured in herds of members indicate increased production of milk, increased breed interest, increased number of pure bred cattle and increased inventory values. The presence of superior bulls in a community stimulate general interest in better breeding and through their offspring provide a valuable source of well bred animals of both sexes for further improvement work. I believe this project one of great value and that it is destined to have far reaching effects in improving the quality of the dairy cattle of our state.

CALF CLUBS—The purpose of club work is to introduce good pure bred foundation animals, to give club members fundamental instruction in dairying and to direct them in developing and caring for their heifers through at least one lactation period. The club member not only benefits but the adoption of better practices often extends to the entire herd and often quite generally throughout the community. In selecting calves effort is made to get those of good type and from dams having a certified production of 400 or more pounds of butterfat.

There has been a very material expansion in this project during the year the number of clubs having increased from 33 to 57. An outstanding instance of development in this project was the organizing in Union county of a group of clubs aggregating 70 members each owning a Holstein heifer calf. Fifty of these calves are on exhibition here in Harrisburg today.

CO-OPERATIVE MARKETING

The co-operative marketing movement is spreading among dairy farmers in Pennsylvania. Approximately thirty thousand (30,000) dairy farmers in the state are now numbered in the

membership of the three great farmers dairy marketing organizations operating in Pennsylvania; the Inter-state Milk Producers Association, The Dairymen's Co-operative Sales Company and the Dairymen's League Co-operative Association.

This great body of dairy farmers are carefully and painstakingly working out through their several organizations their common problems. These problems cover the field of production in all its varied phases, uniformity of supply, standardization of quality, transportation, proper distribution and the maintaining and enlarging of markets.

The year has been one of progress in this important movement. The membership has gained, production has been more uniform, quality has improved, consumption has increased and prices have been more stable. Thus are dairy farmers learning to apply business methods to their industry to the end that greater net returns may be realized and the consumer better served.

OTHER AGENCIES

There are other agencies actively operating for the benefit of the industry. The Pennsylvania State College through its teaching, research and extension departments is rendering a large and constructive service.

The Philadelphia Interstate Dairy Council and the Pittsburgh Dairy Council are untiring in their educational work seeking to acquaint the people with a knowledge of the superior food value of milk and its vital importance in the diet. These organizations also maintain quality control departments that assist dairy farmers in quality improvement work.

The agricultural and dairy press of our State have given active support throughout the year to the general dairy improvement program of the various dairy agencies and have initiated construction projects of their own.

The Pennsylvania Dairymen's Association should and does function as the co-ordinating agency, through which the industry as a whole may speak. Its field is large and its officers and membership desire that it render a real service to the producer, manufacturer, distributor and consumer of dairy products.

Program of Annual Meeting

The Pennsylvania Dairymen's Association Harrisburg, January
18, 1928, Senate Caucus Room, Capitol Building

E. B. FITTS, State College, President

R. F. BRINTON, West Chester, Secretary

WEDNESDAY MORNING

Call to Order.

President's Address, E. B. Fitts, State College, Pa.

Securing Maximum Milk Production at a Minimum Cost.

Mr. E. J. Perry, Extension Specialist in Dairying, College
of Agriculture, New Brunswick, New Jersey.

The Use and Abuse of Protein in the Rations of Dairy Cattle.

Dr. F. B. Morrison, Director New York Agricultural Exper-
iment Stations, Geneva, New York.

Economic Aspects of T. B. Testing.

Dr. J. A. Kiernan, Chief of Tuberculosis Eradication Divis-
ion, Bureau of Animal Industry, U. S. Department of
Agriculture, Washington, D. C.*

WEDNESDAY AFTERNOON

Business Session.

What the Distributor Expects of the Producer in the Matter of
Quality in Milk and Why.

Mr. H. D. Davis, Production Manager, The Supplee-Wills-
Jones Milk Co., Philadelphia, Pennsylvania.

A Practical Plan of Ridding the Herd of Contagious Abortion.

Dr. E. S. Deubler, Superintendent, Penshurst Farm, Nar-
berth, Pennsylvania.

Should Minerals be Added to Dairy Rations.

Dr. F. B. Morrison, Geneva, N. Y.

Dairy Herd Improvement Through the Sire.

Mr. J. H. McClain, in Charge Dairy Introduction Bureau
of Dairy Industry, U. S. Department of Agriculture,
Washington, D. C.

WEDNESDAY EVENING

At Masonic Temple, Banquet Hall.

THE DAIRYMEN'S BANQUET

All Dairymen, their families, and friends invited

E. B. FITTS, Toastmaster

Short talks by—

Dr. C. G. Jordan, Secretary of Agriculture.

Dr. R. D. Hetzel, President, Pennsylvania State College.

Dr. F. B. Morrison, Director, New York Agricultural Experiment Stations.

Address—"The Three Legged Stool of Big Business".

Dr. H. E. Van Norman, President, American Dry Milk Institute, former President of World's Dairy Congress and of the National Dairy Association.

Announcement of awards to Dairymen in Cow Testing Associations who have done meritorious work during the past year.

Announcement of winners of prizes in the milk show.

*Owing to the death of Dr. Kiernan, this address was given by Dr. J. B. Reidy.

Annual Business Session

The general business session of the Pennsylvania Dairymen's Association was held in House of Representatives at 1.30 P. M., January 18th, 1928, the meeting having moved to this room because the Senate Caucus room was so full that no more could get in the door.

The minutes of the previous annual meeting and of the Spring meeting was held at State College were read by the Secretary-Treasurer, Robert F. Brinton, and approved. His annual report showed a healthy growth in membership and that the association had taken an active part in legislative matters of interest to dairymen. During the year the secretary sent out almost 1800 letters to members of the legislature, the Trustees of Pennsylvania State College, and to members.

The money paid into the treasury during the year was \$1,014.00, the expenditures were \$954.26, and the balance January 4th, 1928 was \$169.94. An auditing committee composed of William Vandergrift and Norman Thompson reported this balance to be correct.

A nominating committee previously appointed by President E. B. Fitts, composed of J. A. Poorbaugh, H. B. Steele, W. F. Shrum, H. D. Allebach, and A. A. Borland, reported the following nominations:

For President E. B. Fitts.

1st Vice President L. M. Thompson.

2nd Vice President M. T. Phillips.

3rd Vice President W. F. Shrum.

Sec.-Treas. Robert F. Brinton.

There being but one candidate for each office the Secretary was instructed to cast a ballot and the nominees were declared elected.

A resolution committee composed of R. W. Balderston, W. S. Wise, and Miles Horst, presented the following resolutions which were approved.

1. The Pennsylvania State Dairymen's Association would commend the efforts of representatives and committees of various interested groups to secure through conference, and if need be, by legislative enactment, a clarification of the situation with respect to state and local sanitary regulations governing the production and distribution of milk in Pennsylvania, and would approve further effort in this line to be participated in by all interested parties.

2. The Pennsylvania State Dairymen's Association approves the efforts of the State Council of Agriculture Associations

to secure wider distribution of electricity for light and power throughout our rural areas and urges that these efforts be continued through the Joint Rural Electric Committee appointed by the State Council of Agricultural Associations and the Pennsylvania State Electric Light Association to increase the use of such on farms. We feel that electricity is a particularly valuable aid in relieving the drudgery and increasing the efficiency on dairy farms.

3. Realizing the increasing importance of proper buildings for dairy farms to meet present day sanitary requirements, and to conduct such farms in an efficient manner, and realizing further the high present-day cost of building, the Pennsylvania Dairymen's Association would urge the Pennsylvania State College and Experimental Station to continue, and if possible, to enlarge the recently inaugurated program of research in dairy barn construction and ventilation to the end that our Pennsylvania farmers may be aided in remodeling existing barns and other farm buildings, and to replace those lost by fire or otherwise with due arrangement for their efficiency, and with greatest economy in erection, maintenance and operating costs.

4. The prevention, eradication, and cure of diseases of farm animals being of great and increasing importance both to our agricultural interests, and to the State at large, the Pennsylvania State Dairymen's Association would commend the efforts of the State Department of Agriculture to eradicate bovine tuberculosis, contagious abortion in cattle, and other diseases. The Association would urge further research by appropriate bureaus of the State Department of Agriculture, and the Pennsylvania State College in the matter of contagious abortion. It would recommend a continuance of at least the present rate of progress in bovine tuberculosis eradication in the State.

5. The Pennsylvania State Dairymen's Association approves of further research by the Pennsylvania State College and Experimental Station in the field of the production and distribution of dairy products, and of continued service by the Pennsylvania State Department of Agriculture, and the U. S. Department of Agriculture in the field of dairy statistics.

6. The Pennsylvania State Dairymen's Association heartily supports the constitutional amendment to be voted on next Fall providing for a state bond issue of \$8,000,000.00 for new buildings at Pennsylvania State College, and urges its members to aid in distributing information regarding the building situation at the College to the end that voters throughout the state may fully understand the importance of the amendment.

There being no further business to come before the meeting the educational program was continued.

Securing Maximum Milk Production at a Minimum Cost

E. J. PERRY, *Extension Specialist in Dairying*

New Jersey Agricultural College

As one fellow aptly put it, "I have yet to meet the man who wishes to know less than he does, but I know many who seem unwilling to learn any more." In any attempt at a survey and appraisal of present day methods and present day needs in economical dairy farming, a question that often arises is, "To what extent do the dairy cattle owners of today appreciate the scientific aspects of their business and what would be the results if that appreciation were what it ought to be?" Dairying is a branch of agriculture which has as its handmaidens several of the well-known sciences, such as chemistry, biology, genetics and bacteriology. It is an occupation which can logically challenge every one of its followers to a keen appreciation of the scientific. It is not consistent that one should marvel at the radio, aeroplane, X-Ray, and other recent inventions and then fail to detect the part that science plays in the field of dairy husbandry from which is produced a food that is the most essential one in the human dietary. Yet there are those who manage their cows as if they were less impressionable than pieces of stone or wood.

It is gratifying however that increasing numbers of milk producers are recognizing that they must be as up-to-date in their methods as are those engaged in other branches of the industry represented by the ice cream makers, the butter and cheese manufacturers and the milk distributors. The milk maker who feeds with a scoop shovel and uses a scrub bull will get no farther than the man who attempts to sell milk in one of our metropolitan centers by dipping it out of a can conveyed on a wheelbarrow.

ESSENTIAL FACTORS IN PROFITABLE DAIRYING

In dairy farming certain essential factors have to do with securing high milk and butterfat production at a low cost. It is difficult if not impossible to name these factors in the order of their importance, because of their supplementary and complementary nature. They are:

- 1—Health.
- 2—Good Breeding.
- 3—Good sized cows.
- 4—Proper adaptation of size of herd to size of farm.
- 5—Record Keeping.
- 6—Good Feeding.

I shall mention the first four factors only briefly. A herd that is ravaged by such diseases as contagious abortion, garget or tuberculosis is very likely to be a money loser and a source of endless worry and dissatisfaction to the owner. If a member of a milking herd fails to conceive she is no longer a dairy cow. Garget or contagious mammitis is a scourge which may work almost as great havoc as abortion. Tuberculosis has caused and is still causing uneconomical production in thousands of herds, but is gradually being eradicated. It is believed that in the next 50 years many vexing problems among these three dread diseases will be solved.

Good breeding is another cog in the wheel which is rightly receiving increasing attention today. To be well bred is coming to mean that the cow or bull must possess the ability to pass production and type along to the offspring. If our world record producers and show winners are merely the result of chance, then breeding is not a science and far less an art. No one maintains that production and type can ever be controlled with mathematical precision. Herein lies the art of breeding. Science is helping to control the factors which will aid in insuring more uniformly high production and desirable type.

Good size in cows is essential. If the milk flow did not depend upon the feed flow, size or capacity would not merit the dairy farmer's attention. The large cows within each breed are the ones that break state and world records.

Adapting the size of the herd to the size of the farm is an important factor for the average herd owner. Unless a very special milk or butter or cream market is at hand, it does not pay to buy all of the roughage and grain required. The marketing of good roughage through good cows is always a profitable enterprise under general conditions.

I now come to the last two factors mentioned—Record Keeping and Feeding. It is my desire to speak first of all about the keeping of records as a guide in the various phases of the farmer's job of producing milk economically, and then to discuss feeding in relation to record keeping; to demonstrate by actual figures what results are possible by using records intelligently.

RECORDS AND THE COW TESTING ASSOCIATION

A farmer once told me that by glancing at the milk in the pail he could tell within half a pound the exact amount of milk each cow gave. I told him that he was either a world beater of a judge or that his name should be Ananias. Perhaps luckily for me he was not aware of the part that Ananias played in Biblical history.

To day a good dairy cow costs approximately \$175 whether she is raised or bought. She eats \$130 worth of feed yearly. Here is involved a sum of \$305. Is it worth checking up each month or even more often on such a costly machine? Now there are a few brave souls who are able and willing to weigh the milk of each cow daily or monthly and figure up not only the monthly production but the yearly production as well. But few of these men have the time to keep feed accounts on each cow. The cow-testing Associations or Herd Improvement Associations therefore have grown quite popular during the last 24 years because for a very nominal fee they furnish a member the information mentioned.

The cow-tester is the bookkeeper for the dairy herd. If he is well informed and an enthusiastic believer in good dairy cows as mortgage lifters, he becomes an efficiency man. Test Associations in this country have increased from 1 to nearly 900 since 1903, yet they are not popular enough considering their function. The 22,000 or more men who are members constitute only one-half of 1% of the dairymen of the country.

It is an excellent business proposition for every owner of 10 or more cows to get a year's milk, fat and feed records on each of his cows. He is almost certain to find one that is a poor producer, but never-the-less a heavy eater, the sale of which at butcher's price will pay for his year's fees in the Herd Improvement or Testing Association; or the tester may uncover several counterfeits in the herd in which case his membership in the association can be likened to having the services of a fire engine which extinguishes the devastating flames before the property is consumed. If the records reveal no loafers, the owner will have \$50 worth of satisfaction in knowing what a good herd he has and in addition he will have a working knowledge of the herd never possessed before.

Briefly stated the major benefits of yearly records in the Herd Improvement Association are as follows:

1—The fat test, the fat, milk and feed record in each cow are obtained, thus enabling intelligent culling.

2—The record of yield serves as a guide in feeding grain and roughage.

3—The records are used as a basis of breeding operations.

4—The bulls are tested by comparing the records of their daughters with the dams of the daughters.

5—The herd average furnishes a means of noting the yearly progress of the herd and is a means of comparison between association herds.

The increased average production per cow in the Mercer County, New Jersey Association from 6101 lbs. of milk and 230

lbs. of fat to 8187 lbs. of milk and 300 lbs. of fat in the period from 1919 to 1926 is a good recommendation for continuous record keeping as a guide to good management.

CONTINUED RECORD KEEPING AND WHY

(An Example from a New Jersey Association)

Mercer Association 1919		Mercer Association 1927
6101	Average Milk Per Cow	8187
230	Average Fat	300
125	Average Feed Cost	135
129	Average Returns over Feed	232
254	Average Lbs. Fat of 5 Best Herds	345
186	Average Lbs. Fat of 5 Poorest Herds	258
1	No. Herds over 300 Lbs. Fat	8

RECORDS BRING RETURNS IN ECONOMICAL FEEDING

Today feeding constitutes 50 to 60% of the yearly cost of keeping a dairy cow. The right use of records not only saves on feed but assists in securing maximum milk flow and helps to maintain it. A pair of scales is as important in front of the cow as they are behind her. If the grain of each cow is not weighed, the purpose of the scales will be answered if it is known how many pounds the feed measure holds, but this measure must not be a scoop shovel, wash boiler, or candy bucket. It is true, the feeding of cows is not an exact science like engineering. A tunnel is to be dug through a mountain. Two groups of workmen, one each side of the mountain and in charge of civil engineers with their instruments begin digging toward each other. Eventually the two groups will meet under the mountain without a divergence of more than one or two inches. The securing of a maximum milk yield from a herd over a long period is not so absolute, and certain in its results as this tunnel digging. Without individual cow records however as a basic guide successful feeding will be much less absolute. The record is the feeder's surveying instrument which will help to map out for him an intelligent course in feeding.

Fifteen or more years ago perhaps the paramount problem in dairy cattle feeding was the balancing of rations; much work yet remains to be done on it. But years ago, feeds were cheaper than today and the too liberal use of concentrates oft times did not reduce profits rapidly. Now while it does not take much extra milk to pay for a little extra grain, it must be remembered that a little extra today and quite a little extra tomorrow will result in trouble for the cow and the pocketbook. Overfeeding means giving a cow more than she can utilize economically. Over-

feeding each cow one pound of grain daily in a herd of 15 will result in an extra feed cost of \$112 over a 10 month period. Furthermore, too much grain may throw a cow off feed for several days at a time.

Today there are a large number of good, ready mixed commercial dairy feeds on the market, most of which are giving very satisfactory results. Those dairymen who are practicing home mixing are also doing a better job than they or their fathers did 20 years ago. This leads to my growing belief based on data from Herd Improvement Associations that the question of how the dairyman should feed is fully as important as the question of what he should feed. The purchasing or mixing of an excellent dairy feed and then the subsequent overfeeding of some cows and the underfeeding of others is like "saving at the spigot and leaking at the bung hole."

The general feeding rules commonly followed by progressive dairy farmers are the result of many years of painstaking research work by various Experiment Stations. While it is admitted these rules cannot be followed to the letter for individual cows, they certainly do afford a system which science has decreed is worth adopting. Every big business enterprise must have a system or set of systems. Anything else would mean chaos. The general feeding rules referred to are:

GENERAL FEEDING RULES

1. Feed all of the roughage the cow will clean up. A legume hay and some succulence should be provided.
2. Feed 1 pound of grain to every 3 pounds of milk produced daily by Jerseys and Guernseys; and 1 pound to every 3½ to 4 pounds produced daily by Holsteins, Ayrshires and Brown Swiss.
3. Milk is 87% water—see that the cows get plenty of it at all times.
4. Cows need salt—one to two pounds per hundred weight in the feed is sufficient.
5. Study each cow's likes and dislikes and cater to them when possible. The application of these rules is helping to secure maximum production at low costs.

A VICTORY FOR SCIENTIFIC AS WELL AS PRACTICAL FEEDING

The following tables of figures taken from New Jersey Herd Improvement (Cow Testing) Associations emphasize the "worthwhileness" of feeding grain strictly according to production records and constitute a victory for scientific management, out of the farms:

REDUCING FEED COSTS IN PRODUCING MILK

(New Members in Burlington, N. J. Test Association)

Herd Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Breed	G	H	H	G	G	H & J	H & G	H & G	G & J	J	J	G & J	G	J
Average Grain per Cow	180	299	209	243	220	177	189	378	144	195	194	187	223	194
Monthly Mar., 1926	104	288	141	150	181	237	194	133	78	103	161	114	212	140
Grain per Cow Monthly														
March, 1927														
Feed Cost of 100 Lbs.														
Milk March, 1926	\$2.58	\$2.19	\$1.82	\$2.51	\$2.34	\$1.94	\$2.04	\$1.88	\$3.43	\$2.83	\$2.46	\$2.60	\$3.03	\$1.89
Feed Cost of 100 Lbs.														
Milk March, 1927	\$2.30	\$1.57	\$1.50	\$1.60	\$1.68	\$1.46	\$1.53	\$1.58	\$1.78	\$1.85	\$1.63	\$1.63	\$1.67	\$1.45
Reduction per 100 Lbs.														
per Herd	.28	.62	.32	.91	.66	.48	.51	.30	1.65	.98	.83	.97	1.36	.44

Average Feed Cost of the 14 Herds for March, 1926.

Average Feed Cost of the 14 Herds for March, 1927.

Average Feed Cost Reduction per 100 Lbs.

Money Saved in Year for the 14 Members.

(There were 22 Cows per Herd—Average Yearly Production Being 7600 lbs. Milk)

Average Feed Cost of the 14 Herds for March, 1926.	\$2.39
Average Feed Cost of the 14 Herds for March, 1927.	1.63
Average Feed Cost Reduction per 100 Lbs.	\$0.76
Money Saved in Year for the 14 Members.	\$17,790

SOME RESULTS FROM MORRIS COUNTY

(From Morris Testing Association)

HERD No. 1—HOLSTEINS

	Cows Milking	Cows Dry	Total Month's Milk	Lbs. Wet Grain	Dry Grain	Hay	Returns over Feed Cost	Feed Cost of 100 Lbs. Milk
March	8	2	5279	3472	2436	8680	—\$64	\$4.94
April	7	3	5349	1440	1865	5700	+ 32	3.11

HERD No. 2—GUERNSEYS

	Cows Milking	Cows Dry	Total Month's Milk	Lbs. Grain	Hay	Silage	Feed Cost	Returns over Feed Cost	Feed Cost of 100 Lbs. Milk
March	19	1	11565	7816	6479	15066	\$289	\$185	\$2.49
May	21	0	14556	5580	3255	11067	227	381	1.56

Rate of grain feeding in March—1 lb. grain to 1.4 lbs. milk

Rate of grain feeding in May—1 lb. grain to 2.6 lbs. milk

HERD No. 3—HOLSTEINS

	Cows Milking	Cows Dry	Total Milk	Lbs. Grain	Feed Cost per 100 Lbs. Milk
March	19	3	12,817	8913	\$2.75
April	18	3	13,965	4095	1.89

Feeding Rate March—1 to 1.4

Feeding Rate April—1 to 3.4

A STUDY IN PRODUCTION AND FEED COSTS

(Herd No. 9 in Burlington, N. J. Test Association)

	Cows Tested	Cows Dry	Total Milk	Lbs. Hay	Lbs. Silage	Bundles Corn Stover	Lbs. Molasses	Lbs. Grain	Feed Cost	Returns Over Feed Cost	Feed Cost per 100 Lbs. Milk
March, 1926.....	19	1	11256	6840	0	570	0	7200	\$212.16	\$154.79	\$1.88
March, 1927.....	16	3	8169	3584	8960	256	320	2128	129.96	155.96	1.58

CHANGING GRAIN MIXTURE AND AMOUNTS

(From Flemington, N. J. Association)

	Cows Milking	Total Milk	Total Fat	Total Grain	Total Hay	Total Feed Cost	Returns Over Feed Cost	Feed Cost per 100 Lbs. Milk
March, 1927.....	15	11920	392	14756	5580	\$257	\$308	\$2.15
April, 1927.....	17	12734	456	5370	4590	156	447	1.23

Grain Mixture Fed in March

200 Lbs. Corn and Cob Meal
100 " Flax Screenings
Cost \$27.20 per Ton
Protein 10.3%

Grain Mixture Fed in April

600 Lbs. Corn and Cob Meal
225 " Wheat Bran
150 " Oil Meal
150 " Cottonseed Meal
Cost \$33.00 per Ton
Protein 17%

Maximum production is a necessary concomitant to low costs. This is plainly evidenced in the following chart showing the relation of production to other factors. The average yearly production for all New Jersey cows is 5600 lbs. of milk. This average cow eats \$120 worth of feed whereas the 10,000 lb. cow eats \$132 worth. The 4400 lbs. additional milk is made at an extra feed cost of \$12.

THE RELATION OF YEARLY MILK PRODUCTION TO OTHER FACTORS

(From 12 New Jersey Associations)

Number of Cows	Average Lbs. Milk per Cow	Value of Product	Cost of Feed	Returns over Feed Cost	Feed Cost of 100 Lbs. Milk
15	2018	\$102	\$87	\$15	\$4.31
48	3122	134	100	34	3.20
201	4089	165	102	63	2.42
418	5176	210	113	97	2.18
654	6253	233	123	110	1.97
795	7084	269	127	142	1.79
921	7942	278	128	150	1.61
735	9156	300	132	168	1.44
588	10097	325	134	191	1.33
348	11244	341	137	204	1.22
168	12046	380	144	236	1.19
141	13159	405	157	248	1.19
81	13986	434	160	274	1.14
30	15143	412	155	257	1.02
9	16092	451	175	276	1.08
9	17008	491	176	325	1.03
5161	Av. 8164	\$284	\$128	\$155	\$1.56

ANNUAL SUMMARY BY MONTHS OF A TYPICAL NEW HERD IN PASSAIC ASSOCIATION

	Cows Dry	Cows Milking	Total Milk	Total Grain	Grain to Milk Ratio	Feed Cost per 100 Lbs. Milk
December, 1926	2	18	13770	8399	1.6	\$2.79
January, 1927..	1	17	14489	8541	1.7	2.49
February.....	2	18	14874	6580	2.2	2.35
March.....	2	19	17475	7579	2.3	2.73
April.....	0	19	17427	6600	2.6	2.00
May.....	1	15	14121	4154	3.3	1.87
June.....	3	14	14652	4320	3.3	2.03
July.....	3	14	12939	4805	2.6	1.91
August.....	0	16	18073	4960	3.6	1.35
September.....	1	17	18480	5010	3.6	1.35
October.....	0	15	13687	3875	3.5	1.49
November.....	1	14	11700	3900	3.0	2.03

SAME AMOUNT OF MILK WITH 40% FEWER COWS

The average for the 9000 cows in the Herd Improvement Association of New Jersey is 8200 lbs. of milk per year. If all dairymen of N. J. kept cows of this caliber, the amount of milk—80,000,000 gallons—produced in 1927 could have been produced with 40% fewer cows. This percentage of 30-40% of variation in production between the average cow and the association cow

will hold good in most other states. The Bureau of Dairy Industry of the U. S. D. A. advises that it would require 540,000 average cows to equal the yearly production of 360,000 cows now being tested in the Herd Improvement Associations.

The Bureau of Dairy Industry of the U. S. Department in tabulating and summarizing ten of thousands of individual yearly records has discovered this striking rule, "As yearly production doubles, returns over feed costs are trebled; as production trebles, the returns over feed cost are sextupled." I think this is one of the golden rules in dairy farming and should be memorized by every cow owner. The importance of securing some additional milk flow was recently brought to light in a commercial dairy of 300 cows in New Jersey. The replacements in this herd were purchased as milking cows and the average period of service per cow was three and one-half years. Figured at the wholesale price of milk, it was learned that every extra quart of milk secured daily from a cow over this period was worth \$75; or in other words if a 10 quart cow replaced a 9 quart cow, the former was worth \$75 more to her owner.

Maximum production at the minimum cost can be obtained by adopting scientific methods which have proved to be practicable. Milk, fat and feed records constitute the basic guide to intelligent herd improvement which has as its goal the building up of high production and the elimination of unnecessary costs. The Herd Improvement or Cow Testing Association affords the best means of securing these records for the man who depends upon the sale of milk as a major source of income. Taxes, labor and certain other costs are fixed yearly charges which are usually beyond the control of the dairyman. The feed bill is a more flexible factor. The haphazard feeding of concentrates is the weakest link in the feeding chain on the majority of dairy farms today. Whether ready mixed or home-mixed, all farmers agree that feeds are high priced. The careful use of records in giving each cow the amount of feed she requires, is lowering production costs and increasing profits throughout the country as never before; and those who follow this practice are firm in the conviction that the dairy cow is a great laboratory which is deserving of the most careful study and management if the owner is to be successful.

Use and Abuse of Protein in the Rations of Dairy Cattle

DR. F. B. MORRISON, *Director of Agricultural Experiment Stations, New York*

Every farmer naturally wishes to secure as much profit as possible from his farming operations. Yet many fail to appreciate the basic facts which make profits possible.

No fact has been more clearly proved by the many experiments carried on at the various Agricultural Colleges and Experiment Stations than the fact that balanced rations are absolutely necessary for maximum profits in stock farming. This fact has been clearly recognized by scientists ever since the first feeding standard was worked out by a European chemist in 1864.

Since then we have adopted into our every day lives the triumphs of modern scientific inventions—the telephone, the electric light, the automobile, the phonograph, and the radio. Yet many of us have failed to adopt in a similar manner the discoveries of the scientists regarding efficient stock feeding.

CHANGED CONDITIONS REQUIRE MORE SCIENCE

In pioneer days, with land low in price, pasturage abundant, and feed and labor cheap, it was relatively easy to make a profit from stock farming. This was true, even though one knew little about the principles which govern the feeding and care of live stock and though he did not understand the value of the different stock feeds.

Conditions have now changed radically. It is less easy for the inefficient man to make profits in farming. Nevertheless, I believe that the future will hold out fully as great opportunities as the past, for the farmer who is a master of his profession.

However, we must all realize that to make a good profit from stock farming or any other type of farming in the present and in the future, it will require a much more intelligent and scientific kind of farming than in the past.

FARM ANIMALS ARE LIVING MACHINES

Many people do not understand that farm animals are machines for converting or changing the crops of the fields into valuable animal products. Just as it is impossible to manufacture steel from the wrong kind of materials, so these living machines can not manufacture animal products efficiently and economically unless they are supplied with the right amounts and kinds of raw materials.

We call a ration or daily feed which furnishes an animal with the correct kind and the right amount of the various food materials for its particular needs, "A Balanced Ration". Many farmers seem to be afraid of this term "balanced ration". Though they have heard about balanced rations, they have a very hazy idea as to whether the feeds they are supplying their stock provide balanced rations or not. In other words, they do not know whether they are furnishing their live stock with the right kind or the proper amount of the various food nutrients to permit them to make profits.

PROTEIN THE KEY TO BALANCED RATIONS

Protein is the food material most apt to be lacking in ordinary rations, and protein in abundance is needed by animals to furnish the raw material for the manufacture of meat, muscle, wool, and the protein part of milk. Therefore, the most important part of balancing a ration for live stock is to provide a proper amount of protein in the ration.

Recent investigations show that vitamins and mineral matter are also necessary for efficient rations. Fortunately, however, as is pointed out later in this discussion, these needs can generally be fully supplied by providing stock with good pasture in the summer and with plenty of well cured legume hay in the winter, perhaps with the addition of relatively cheap mineral supplements to furnish plenty of calcium and phosphorus.

IMPORTANCE OF BALANCED RATIONS

It is important for stockmen to realize that the proper "balancing" of a ration often makes the difference between profit and loss.

In an experiment carried on some years ago by the Illinois Experiment Station, one lot of cows was fed a ration which was palatable and sufficient in amount, but which was not balanced. These cows were fed all the corn silage they would eat—all the ground corn they wanted, three pounds of clover hay, and all the timothy hay they desired. The chief defect of this ration was that it was very low in protein.

These cows gave twenty pounds of milk a day, a yield which under present conditions is too low to be profitable. This was in spite of the fact that they had good productive capacity.

Later their ration was balanced by feeding sufficient protein-rich feed to meet the requirements of the feeding standards. These same cows then gave over thirty pounds of milk a day, an increase of about fifty per cent.

Numerous other examples might be given which show that an unbalanced ration is inefficient and unprofitable. Any farmer

who is feeding his cows, his pigs or any other class of stock such a ration has no license to kick if he does not make any money. He might as well face these facts squarely.

To show how much protein and other food materials the various classes of animals need, scientists have carefully prepared "feeding standards". By the use of these tables, together with other tables showing the food materials (digestible nutrients) furnished by the different feeds, one can, after a little practice, work out efficient balanced rations for his animals.

ADJUST THE CARBURETOR CORRECTLY

No one expects to get a good mileage from the gasoline he buys unless he has the carburetor on his automobile adjusted correctly. Yet many men pay large sums for feed without knowing whether their purchases will correctly adjust the carburetors of their live stock. In other words, they do not know whether the feeds they supply will provide their stock with a correct mixture of the various food nutrients, just as the correctly adjusted carburetor provides the gasoline engine with the right mixture of gas and air.

Every stock farmer who looks upon farming as a profession rather than merely as an occupation will take pride in mastering the methods of working out balanced rations. These are no more difficult than the problems in arithmetic he solved in the district school when a boy.

If a farmer does not know whether he is feeding a balanced ration or not, and has not learned how to figure out such a ration, there is nevertheless no reason why he should remain in doubt. If he is fortunate enough to live in a county which has a County Agent, he will find this man glad to help him. Otherwise, he can get advice from the Agricultural College or from his farm paper. In 1927 there is no excuse for feeding inefficient, unbalanced rations.

MODERN FEEDING STANDARDS

Previous to 1915 the old German feeding standards, originally prepared by Wolff in 1864 and revised slightly by Lehmann in 1896, were generally still taught to students of live stock feeding in this country and were commonly used in balancing rations for most classes of live stock. These standards were prepared before the development of modern live stock experimentation and were naturally inaccurate and incomplete. Furthermore, they did not meet many American conditions. The speaker, therefore, formulated feeding standards in 1915 for the various classes of live stock, which have come into general use since that date.

These standards were based upon recent investigations conducted by various scientists at various institutions to determine the nutrient requirements for the various classes of live stock.

The recommendations for dairy cows in these standards are based mainly upon the investigation and the feeding standards of Haecker and Savage. To show the level of protein recommended, it may be stated that for a cow producing 1 pound of butter fat daily a nutritive ratio somewhere between 1:7 and 1:6 is advised. For higher producing cows, narrower nutritive ratios are recommended in accordance with their actual production.

Recent investigations by Hills and associates at the Vermont Station and by Hayden and associates at the Ohio Station have shown that cows will give fair productions of milk and butter fat on lower allowances of protein than have thus far been recommended in feeding standards. However, we must bear in mind that the dairy cow that produces a *large* amount of milk is usually the cow that returns the greatest profit. I do not feel that it has yet been definitely shown that good dairy cows will yield as large and as profitable a production on a very low allowance of protein as they will when fed according to the recommendations of the present feeding standards. Consequently, I would not advise feeding less protein than advised in such standards, unless perhaps under conditions when protein-rich feeds were temporarily extraordinarily expensive in comparison with feeds low in protein content.

ARE BALANCED RATIONS OUT OF DATE?

Recently a few men have attacked the idea of balanced rations in the public press. In particular one prominent feed manufacturer has pointed out certain well-known facts just as if they had been recently discovered and on this basis has sought to discredit the idea of balanced rations.

He has pointed out that animals fed only sufficient feed for maintenance digest their feed somewhat more thoroughly than those being fed a liberal productive ration. This, by the way, is no new discovery, but has been known to scientists for many years.

Furthermore, he points out that practically all the digestion trials conducted by the various experiment stations to determine the digestibility of different feeds have been carried on with sheep or steers fed limited rations. Consequently, the figures for the digestible nutrients in a given feed, computed on the basis of such digestion trials, are higher than they should be in the case of a liberally fed animal, such as a dairy cow fed a good ration.

This is all true, and, moreover, has been long known. This man fails to point out at the same time that *modern feeding standards have been devised so that they take these very facts into consideration*. In other words, rations balanced according to modern standards do give good results and efficient results with the various classes of live stock.

This feed manufacturer has sought to convey the idea to farmers that neither they nor their farm organizations can safely and efficiently work out balanced rations for their stock, but that they can feed their stock adequately only by purchasing certain brands of mixed feeds, such as he manufactures. This is, of course, absurd.

LIMITATIONS OF FEEDING STANDARDS

In this connection it should be pointed out definitely that no feeding standard can yet make recommendations with regard to such factors as quality of proteins, mineral nutrients, and vitamins. Our knowledge concerning these recent discoveries in nutrition is too recent and too fragmentary to enable us to put down in mathematically expressed feeding recommendations concerning these new factors in stock feeding.

This does not mean that we should abandon feeding standards. On the other hand, they are still as necessary as ever. We must use them intelligently, however, bearing in mind that a feeding standard indicates merely the proper amounts and proportions of protein and other common nutrients in a ration. In addition to a proper "balance" of protein and total digestible nutrients, we must see that the ration furnishes the right kind of protein and that it provides the proper mineral nutrients and vitamins.

HOME GROWN RATIONS FOR MILK PRODUCTIONS

Since it is a matter of much practical importance to determine whether dairymen can provide a simple, cheap home grown ration which will maintain high dairy production, extensive experiments were carried on at the Wisconsin College of Agriculture to study this matter.

During two winters we fed cows in our pure bred dairy herd a ration consisting of alfalfa hay, corn silage, and a mixture of half corn and half oats (all home grown feeds) in comparison with a ration made up of the same feeds plus a mixture of linseed and cottonseed meal.

In the first experiment each group of cows was continued on the same ration throughout the entire winter period. This was done as it seemed possible that the home-grown ration might maintain a high production for a brief period, but that the amount

of protein in the ration might be too low to keep up the production throughout the winter. In the second trial the double reversal method was used so as to eliminate the effects of the individuality of the cows.

In each trial the home-grown ration containing no purchased concentrates maintained the yield of milk and of butterfat as well as the ration to which linseed meal and cottonseed meal had been added.

These trials, together with the results of nutrition experiments previously carried on by the Agricultural Chemistry Department at Wisconsin, show that when cows have plenty of choice alfalfa hay, there is no need of purchasing expensive protein-rich concentrates to keep up good production. This does not mean that balanced rations are not necessary, but it means merely that alfalfa hay is sufficiently rich in protein to balance the ration when combined with corn silage and a mixture of such farm grains as corn and oats or silage and oats. In these trials the nutritive ration of the home-grown alfalfa-hay ration was 1:6.8 to 1:7.1. These are approximately the nutritive ratios recommended for general dairy production.

For cows forced to maximum production on official tests, it is undoubtedly desirable to increase the amount of protein in the ration by the use of purchased protein-rich concentrates, even when plenty of choice alfalfa hay is available. With such animals the desired object is the largest possible yield of milk without much regard for the economy of production.

THE KIND OF ROUGHAGE IMPORTANT

Even where dairymen purchase all or nearly all of the concentrates they feed their dairy cows, it is exceedingly important for them to realize that the amount of protein they should have in the concentrate mixture they feed should depend on the kind of roughage the cows are receiving.

For example, with all the good alfalfa hay the cows will clean up twice a day, plus corn silage, the concentrates mixture for cows producing as high as 1 pound to 1.25 pounds butterfat a day need not contain more than 16 per cent protein. On the other hand, if there is available only protein-poor roughages, such as timothy hay with corn silage, a concentrate mixture containing 22 to 24 per cent protein is necessary for cows of the same productive capacity.

MANURIAL VALUE OF FEEDS IMPORTANT

In determining the amount of protein-rich feeds to use, the dairyman should not forget to take into the consideration the manurial value of different concentrates. While the manure

resulting from feeding a ton of farm grain has a value of only \$5 to \$6, the high-protein concentrates have a much higher manurial value.

For example, wheat bran has a manurial value of \$11.78 a ton; gluten feed, \$11.51; linseed meal, \$17.42; and cottonseed meal \$23.37. On farms needing additional fertility, and most farms do, these facts are highly important.

IS EXCESSIVE PROTEIN DANGEROUS?

The question is often asked, "Is it dangerous to feed dairy cows a much larger amount of protein than recommended by the feeding standards?" This depends, first of all, on the kind of protein-rich feeds which are fed in large quantities. Without question, the feeding of too much cottonseed meal may be injurious to dairy cows and other livestock. This is due primarily not to its high protein content, but to the fact that cottonseed meal contains more or less of a poisonous compound known as gossypol.

There should, however, be no fear in using a *reasonable* amount of cottonseed meal for dairy cows. When fed in a suitable ration, along with silage in the winter and pasture in the summer, as much as 2 to 2.5 pounds per head daily may be fed with entire safety. In the South as much as 3 to 4 pounds a head daily has been safely fed for long periods as part of a suitable ration.

In general, the feeding of excessive amounts of protein, throws a heavier load than usual on the liver and kidneys in getting rid of the superfluous nitrogenous material. This is perhaps the reason why bad results may follow when cows on official tests are fed an unusually large allowance of protein-rich feeds, unless extreme care is taken in feeding such rations.

PROTEINS MUST BE OF THE RIGHT KIND

Robert Burns wrote, "A mon's a mon for a' that and a' that". Nevertheless we do not believe that one man is like another, or that he has the same capabilities. It is just the same with the proteins in our stock feeds.

Proteins are exceedingly complicated compounds, made up of many different building stones, which the chemist calls "amino acids". Scientists have recently discovered that some proteins contain all the different kinds of amino acids, while others are incomplete, and do not contain certain of these "building stones".

They have furthermore found that animals need for growth and even life itself all of these different amino acids. Furthermore, they cannot manufacture in their bodies any missing amino acids from other amino acids in their food, with the possible ex-

ception of the very simplest ones. Therefore, they must have in their feed an ample supply of all the other amino acids, or growth will be checked, production lowered, or even health destroyed.

The next important thing to remember is that the proteins of all of the cereal grains are of the same general kind or composition. All the grains are low in some of the essential building stones, or "amino acids," which animal needs to build its body tissues, or which a cow needs to produce milk. On the other hand, milk protein contains all of the "amino acids" in the right proportion for the use of animals.

At the University of Wisconsin the Agricultural Chemistry Department carried on experiments which show these facts plainly. They took young pigs and confined them in cages so that they could analyze all the food eaten by the animals and also all the excrements. Thus, they could tell just what went on within the pig. If a young pig is fed corn grain as the only kind of protein, it will be able to retain or use only about 23 per cent of the protein in the corn grain—less than one-quarter.

About the same result will be secured if the pig is fed wheat, barley, oats or rye. It does not make much difference which one of the cereal grains is fed as the only source of protein.

On the other hand, if the same pig is fed milk protein, it will be able to use for growth 55 to 60 per cent of the entire protein in the milk. In other words, it can actually turn into flesh more than one-half of the protein in its feed.

Linseed meal is an excellent feed for live stock, is it not? However, surprising results are secured when linseed meal is fed as the only protein-rich feed to young pigs. They will be able to use only about 17 per cent of the protein in the linseed meal for growth, or even less than when corn or other grain is fed.

If linseed meal is mixed with corn, a trifle better results will be secured than with linseed meal as the only kind of protein. Even with such a combination the results will not be very good, however, for the pigs will be able to use only about one-third of the protein in the mixture.

However, if corn and milk are mixed together in the right proportion to make a balanced ration, then the pigs will use for growth over 60 per cent of the proteins in the milk and corn combination. In other words, we can take this poor corn protein and mix it with the right proportion of good milk protein and make an exceedingly efficient mixture—a mixture which will be just as good as pure milk protein.

The results are due to the fact that milk protein is richer than linseed meal in some of the building stones or "amino acids" which corn lacks. Therefore, the rich supply of these "amino acids" makes good the deficiency in the corn grain. This is an

exceedingly important matter in feeding certain classes of stock. In feeding pigs, especially those not on pasture, it is of vital importance.

I have never yet seen good results in pig feeding where a man has fed young pigs not on pasture such a ration as corn and middlings or corn and linseed meal. Why is this? One of the primary reasons is that the protein in such a ration is not of the right kind or quality.

If some of you have a flock of chickens at home from which you are not getting many eggs, the fault may be in the ration the chickens are receiving. If they are getting corn, oats, linseed meal, wheat middlings, and wheat bran, do not blame the chickens at all. Blame the quality of the protein in the ration. If you would put some meat scraps or plenty of skim milk in the ration and be sure that the chickens are provided with enough mineral matter, they would be able to manufacture more eggs, because they would have the right kind of raw material.

In all stock feeding operations, look at your animals simply as machines which convert the products of your fields into finished products, like meat, eggs, etc. You can not expect a machine to manufacture steel rails from wooden timbers, can you? Neither can you expect a pig to manufacture pig meat from corn protein alone. You must have the right kind of raw material and in the proper amount.

This is a matter of vital importance in swine feeding. For instance, in one experiment we have carried on, pigs that were fed barley and linseed meal gained only about a pound a day. On the other hand, pigs which were fed barley and whey, gained over two and one-half pounds a day. These were well-grown feeder pigs, and, therefore, were capable of making large gains under favorable conditions. This is an exceedingly interesting result, because whey is not very rich in protein, but yet the pigs produced remarkably efficient results.

As you of course know, most of the protein in the milk goes into the cheese, leaving only eight-tenths of one pound of protein in every 100 pounds of whey. Yet it so happens that this small amount of protein is of the very kind that is necessary to supplement barley protein. Therefore, the combination of barley and whey makes an exceedingly good ration for pigs.

Very young pigs need a larger amount of protein than is furnished by barley and whey; therefore they should be fed some protein-rich feed in addition. On the other hand, for well-grown pigs weighing 150 pounds, barley and whey alone make an efficient ration.

QUALITY OF PROTEINS FOR DAIRY COWS

In feeding dairy cattle and also beef cattle, the quality of the protein is not of so much importance, providing you have such good roughages as legume hay and corn silage. This is because the protein in legume hay and in corn forage are of quite good quality. Therefore, if dairy cows are fed alfalfa or clover hay, with corn silage and farm grains, there is no necessity worrying about the quality of the protein in the ration. You can buy whichever protein-rich feed is the cheapest for you to use.

On the other hand, in pig feeding, as I shall mention later, the quality of the protein may make all the difference between profit and loss.

What about feeding boys and girls? Here again, the quality of the protein is of tremendous importance. I have seen children come to a district school bringing lunches which were decidedly unsuitable. What did they bring for lunch? Bread (sometimes bread spread with butter, but sometimes with oleomargarine), jam, coffee (sometimes with out cream), and pickles, pie, or cake. This is an exceedingly poor diet for a young, growing child. The proteins in such a diet are about as unsatisfactory as in the inefficient ration I mentioned that the pigs on barley and linseed meal received. Also, there was not enough protein in such a diet. Furthermore, there were other deficiencies which we shall discuss later.

The high quality of the protein in milk is one of the reasons why it is such a good food for the human family. Milk is not only rich in protein, but the protein is of the very sort that supplements the deficiencies of the proteins in the common grains. Therefore, it is important that children receive an ample amount of it.

INCREASING THE EFFICIENCY OF RATIONS

Just a few words with reference to some of the practical applications of these discoveries, to show that these new truths do make a difference in practical stock feeding. I will mention briefly some of the trials we carried on in swine feeding at the University of Wisconsin.

In some of these experiments we fed corn and linseed meal to pigs on good pasture. Maybe some of you think this would make a good, well-balanced ration, for the pigs had plenty of protein. However, they always made much poorer gains than other pigs which were fed corn and tankage.

I am not speaking now from one experiment, but from the results of several experiments. On the average, pigs, fed corn and linseed meal, have gained only about 1.1 pounds a day, while those fed corn and tankage gained about 1.4 pounds. Re-

duced to a money basis, linseed meal fed as the only supplement to corn for pigs on pasture, was only worth about \$19.00 a ton, compared to tankage at sixty dollars a ton. In other words, though the pigs made fairly good gains, the ration was not an efficient or economical one.

The supply of tankage would not be large enough to meet the demand if all those swine raisers used it who do not have skim milk or other dairy by-products for their pigs. Therefore, we began experiments to see whether we could not dilute the tankage, in order to make it go further.

What we did was to mix linseed meal and tankage in equal parts. We simply put a mixture of half tankage and half linseed meal in one compartment of a self feeder and corn in another and allowed the pigs to help themselves. To our surprise, these pigs did even better than those that were fed corn and tankage. Thus, linseed meal, which was not very efficient when fed as the only supplement to corn on pasture, when mixed with tankage and corn, gave even better results than tankage fed as the only supplement. Reducing the results to a money basis, although linseed meal fed as the only supplement to corn was worth only \$19 a ton, it was worth \$76 a ton when added to a ration of corn and tankage. A surprising difference, indeed.

This simply shows that, as we learn more about feeds, we are able to dovetail them together so as to make much more efficient rations, at least for certain classes of stock.

RAISING FALL PIGS ECONOMICALLY

We have been carrying on experiments for several years to find efficient rations for fall pigs. Farmers in the northern states who have dairy by-products, such as skim milk, available for feeding fall pigs, usually secure quite good results, if they are good hog men. On the other hand, where no dairy by-products are available, often pigs born in the fall fail to thrive and become unprofitable runts.

The ration of corn and tankage has for many years been taken as a standard by the various experiment stations. The ration gives good satisfaction with pigs on pasture, or even for pigs fed in the winter time in dry lot, without pasture, providing they are quite well grown when they are started on the ration.

However, if young fall pigs are fed this ration of only corn and tankage, often several will fail to thrive. This is true, even though the corn which is fed is yellow corn. We have accordingly been trying to develop efficient rations which can be used for feeding fall pigs by men who do not have dairy by-products available.

We have tried many different rations, with varying degrees of success. However, we have finally secured one which is remark-

ably efficient. In fact, we can take young pigs right away from their dams at weaning time and put them on this ration. To our surprise, they will usually do as well as though they had been fed skim milk.

What is this ration? It is simply corn—it may be either yellow corn or white corn, so far as I know—and, in addition, tankage, linseed meal, and chopped alfalfa hay. In this ration, linseed meal and alfalfa both appear to be necessary. If either of these ingredients are left out, the results are not so satisfactory.

We can recommend this ration to farmers as the best combination which we have thus far developed, and one which will ordinarily give them just as good results with fall pigs as though they had dairy by-products available. We are continuing these experiments still further, in the hope that we will find other rations which are just as efficient, or perhaps even more efficient.

GROW MORE LEGUMES

In conclusion, let us consider what all of these recent discoveries mean in terms of practical stock feeding. To me, all of these recent experiments conclusively show the high value of legume hay for stock feeding, and the great importance of dairy products in the human diet.

Let us briefly review the merits of legume hay for stock feeding. First of all, you will recall that I discussed the necessity of livestock getting a sufficient amount of protein—in other words, a balanced ration. One of the primary reasons why you should grow an abundance of legumes is because they are rich in protein, alfalfa hay being nearly as rich in protein as is wheat bran.

Next, I discussed the importance of the quality of proteins, and pointed out that legume hay contains protein of the right kind or quality to supplement the deficiencies of the cereal grains.

Other great advantages of legume hay are the richness in lime and in vitamin A and vitamin D, the two vitamins that are apt to be lacking in the rations fed livestock. Legume hay is rich in both of these vitamins, if it is well-cured and green in color.

There are, therefore, all of these important reasons for growing plenty of legume hay on every stock farm. In other words, these recent discoveries in stock feeding, reduced to their simplest terms, emphasize anew the importance of large acreages of legumes in any well-planned system of agriculture.

Economic Aspects of T. B. Testing

DR. J. B. REIDY, *U. S. Veterinarian, Harrisburg, Pennsylvania*

There are approximately two million herds, containing nineteen million cattle in the country at present, under supervision by State and Federal Governments for tuberculosis eradication, and this number is one-half the cattle in the country. The cattle owners representing these cattle buy replacements from tested herds only, so that owners of untested cattle have lost this immense market for their cattle, while the market for tested cattle is unrestricted, thereby placing a premium on cattle from tested herds.

It is conservative to state that the market value of cattle in modified areas is increased \$10 per head over the same class of untested cattle. At the present time there are 420 modified accredited areas in the United States. Allowing 20,000 cattle to the county, there would be 8,400,000 cattle in those modified areas, and the increased market value of such cattle would be \$84,000,000.

A total of 874 cities and towns, including some of the largest in the United States, have ordinances requiring the tuberculin testing of cattle furnishing milk for consumption. Fourteen states have taken action requiring the tuberculin testing of cattle.

Defiance County, Ohio, recently obtained entrance to the Chicago market and approximately \$350,000 per year is returned to farmers from this market alone. Being an accredited area, this County was able to comply with Chicago's Health Ordinance.

From the above data it is evident that the owners of untested cattle are denied many of the milk markets of the country, thus giving a marked monetary advantage to the dairyman who has tested cattle.

Economic value of T. B. testing to the hog industry is testified to by an Iowa packer as follows:

In 1919 the average loss per hog caused by tuberculosis infection was 75 cents, in 1920 the loss declined to 66 cents, in 1921 to 49 cents and in 1922 to 32 cents. Since 1923 the loss has further declined to 26 cents.

In Wapello County, Iowa, hog breeders have been getting a premium of 10 cents per hundred pounds on all hogs sold. Approximately \$17,000 has been paid in premium money to farmers in the County because their County was in the modified accredited area. The total cost of testing was \$8,689.

The meat packers are paying nearly \$200,000 per year as premiums above actual market on hogs from accredited counties in the corn belt.

Dr. S. E. Bruner, Chief of the Tuberculosis Eradication Division of the Pennsylvania Bureau of Animal Industry, sent a questionnaire to 42 counties in Pennsylvania where considerable tuberculin testing had been done, for information as to the value of the work. The answers stated that the following results had been obtained; viz,

Dairy improvement was noted, consumption of milk had increased, the sale of excess cattle from tested herds showed an increased price over untested cattle, an increased number of calf clubs was organized which would not have been done with untested animals, many owners are starting to raise pure bred stock and eliminate the scrub sire, and a better sanitary condition of barns prevails. Cow testing associations for production are formed in the T. B. tested areas, and the T. B. test has had a beneficial influence upon all phases of the dairy and breeding industry in Pennsylvania.

T. B. testing is good business from an economic angle because it detects diseased animals that if left in the herd would contaminate each individual animal of such a herd.

As an illustration: A few years ago a farmer shipped into the abattoir, thirteen pure bred cattle which had reacted to the tuberculin test, and on post-mortem examination these cattle were found to be badly diseased. I asked this man where he thought the infection came from or how it was introduced into his herd, and his reply was that he had purchased an untested cow five years previous, and this animal probably spread the infection through this herd. He based his suspicions on the fact that soon after this added animal joined his herd the milk production was lowered, and some of these fine milkers soon became boarders instead of earners. He tried to fatten some of these non-producing animals and found that they would not take on flesh even if well fed, so finally one was slaughtered and the veterinarian who examined the carcass said it was a bad case of T. B. and advised the owner to have his remaining animals tested, which was done and the whole herd condemned.

It seems from the history of this case that had the added cow been tested five years previous, it would have been found tuberculous and the remaining twelve cattle saved from this terrible menace. The cost of testing this cow, compared with the saving of twelve cattle, represents in a partial way the loss caused by not testing, or the gain that might have been made if a T. B. test had been given.

The cold economic loss of this herd was greatly added to by the discouragement experienced by this live stock farmer, as his life's work was undone by the T. B. germ.

What the tuberculosis germs did to this particular herd is just an example of what would happen to the live stock industry, if no T. B. testing was done. It may be safely stated that tuberculosis would eradicate the live stock industry if we did not eradicate it.

The consuming public is willing to pay good prices for milk of quality, and milk from cattle free from tuberculosis is, therefore, in much greater demand and brings better prices than other milk.

I was located in the State of Maine for a few years in tuberculosis eradication work and noticed the constant demand of consumers for milk from tested cattle.

Maine is the summer playground of the Northeast, and many boys' and girls' camps were located in that State, and in every case these camps demanded milk from cattle free from tuberculosis.

The City of Chicago now requires all milk entering that City to come from T. B. tested herds, and as you know that City is one of the largest consumers of milk in the world.

Consumers are demanding more and more that their milk supply come from healthy cattle, and since they are the customers of the dairyman it is good business to furnish the kind of an article they demand.

What the Distributor Expects of the Producer in the Matter of Quality of Milk and Why

H. G. DAVIS,

Supplee-Wills-Jones Milk Company, Philadelphia

The subject at hand, "What the Distributor Expects of the Producer in the Matter of Quality in Milk and Why" is a very timely one inasmuch as greater emphasis is being placed on the necessity of a clean wholesome and safe supply of milk for human consumption.

There was a time when "milk was milk—when the consumer was interested in the cream line alone". That day has passed. The consumer today realizes that there are factors other than cream line which make up a bottle of milk.

When a careful analysis has been made it will be agreed that ultimately it is not what the distributor demands of the producer but what the consuming public demands of the distributor that determines what shall be required of the producer by the distributor. The distributor therefore expects the producer to know the demand of the market and meet that demand.

The business of distributing milk is more than a mere commercial undertaking. The distributor has much to do with the maintenance of good health among the people. It is his duty to educate himself to a full appreciation of his responsibility to the people and then to educate the producer to a full understanding of his relationship.

This is an era of education. It is only through education of those vitally concerned in the dairy industry that we can hope to put that industry on a basis whereby all parties concerned will be benefited.

A new day is at hand. The distributor and the producer in my opinion are beginning to look at each other's problems to the end that there may be mutual protection and the guaranteeing of prosperity.

The problem today is one of service. We must operate on a quality and service basis that will meet the demands of the people. When we say people we mean the market. The ultimate consumer is our market and unless the market is satisfied success is not assured. Service to others rendered jointly by the distributor and the producer constitutes the basis of putting our industry on a firm foundation. Each must understand his part in this plan. All business is placed on confidence.

Without confidence there will be little co-operation. The distributor expects co-operation. With the confidence and co-operation of the producer the distributor will have no difficulty in giving to the consuming public that quality and service which it demands.

It is essential that a definite understanding of Quality be had if we wish to eliminate the confusion in the minds of many as to what actually goes to make up Quality in Milk.

I have included in Quality of milk:

Food Value
Healthfulness

Cleanliness
Keeping Quality

MILK AS A FOOD

Milk is one of our most important foods. The food value of a bottle of milk is judged by the depth of the cream line, especially in the Philadelphia territory. While the butterfat content or cream line is not an entirely accurate measure of the food value of milk yet the housewife in many cases accepts or condemns the milk on that one factor alone. The variations in the total food value of milk are so nearly proportionate to the variations in the fat content of the milk that the cream line may be used as an index to the food value of milk. Knowing the importance placed on the cream line by the housewife it is urgent that due consideration be given to this factor.

A large proportion of consumers are desirous of obtaining a milk containing about 4 per cent of fat as is evident in the fact that the sales of the higher grades of milk are increasing. The consumer will pay for a quality product.

STANDARDS FOR MILK

Several states have set minimum standards for milk constituents. The distributor must see that the milk purchased meets not only these minimum legal standards, but also the standards set by the demand of the consumer. The desire on the part of the distributor to satisfy these demands and to meet competition has raised the standard of milk until today we find that low testing milk is not in demand as fluid milk. Legal standards were set to guarantee a reasonably high food value in milk and to prevent adulteration. In other words, food standards protect the public against adulteration and keep off the market, milk of low food value. The distributor must constantly check his raw material by the use of the babcock tester and lactometer to make sure that the adulteration of milk is not practiced.

Herd improvement through elimination of unfit animals is making rapid strides. Elimination of unfit supplies of milk from

the market will do much to educate the public to the value of milk as a food and thereby increase the consumption. It may well be asked, of what value are these minimum legal standards? They are useful in that the consuming public demands milk which meets these standards, and then begins to demand a milk which meets the need irrespective of the legal standard. The distributor begins to supply it making it necessary to educate the producer as to how it shall be produced resulting in an improved milk supply.

The distributor expects the producer to know what the market demands in food value of milk and to strive to produce an article above reproach.

The milk industry has gained its importance because milk and milk products are among the best and cheapest foods, being easily digested and highly nutritious. Pure fresh milk is essential to the welfare of young children and invalids. Too much attention cannot be given to safeguarding the food value of milk, as babies and in some cases invalids receive nothing but milk for subsistence.

MILK MUST BE SAFE

City milk supply problems have developed with the growth of cities. As the cities developed there was a correspondingly increasing demand for milk. Today the city is reaching out great distances for its supply. The greater the number of dairies involved in the production of the milk, the greater are the problems. Safeguarding the healthfulness of the milk is one of eternal vigilance. All germs capable of transmitting specific diseases must be eliminated from the supply at the source. Here again education enters. The distributor appreciates that the health of the consuming public is vitally affected by the milk supply. He also knows that any serious outbreak of disease of milk borne origin seriously affects the consumption of milk.

This was well illustrated in the recent outbreak of typhoid fever in Montreal.

The dealer must take the producer into his confidence. The problem of one is the problem of the other. No intelligent man objects to constructive criticism based upon fair investigation and full understanding of the problems.

The producer is criticised in many cases because he is satisfied to consume milk which he knows to be unsafe. I do not believe in scaring a man into obedience. Show the producer the dangers of a contaminated supply and rely on his good judgment to work his way out. Show him that in cleaning up the milk supply for the distributor he derives the greater part of his benefit. The plea is for the producer to protect his supply for the protection of his own family. If his family is protected we can

feel reasonably sure that the city consumer will be protected. Safeguard the supply at the source.

The factors which influence the bacterial content of milk are the use or disuse of sterilized equipment, clean cows and the use of the small mouth pail. There are other factors which may contribute to the contamination of milk but these I believe are the chief factors to be considered.

Clean cows, healthy cows free from tuberculosis are required. Unsterilized utensils are a great handicap. All utensils must be kept scrupulously clean. Clean milk from a bacterial standpoint cannot be produced in unclean utensils. The responsibility for clean sterile utensils in the end rests with the producer.

The dealer has his responsibility also. The dealer for his part should see that all cans are properly cleaned, sterilized and dried before they are returned to the producer. The producer often does not have the facilities to clean cans properly and if they are not returned to him in good condition it will be difficult for him to ship milk with a low bacterial count. This is especially true when the cooling facilities on the farm are limited. The dealer wants the producer to know that the responsibility for clean utensils in the end is the producer's.

Bacteria causing diseases, including scarlet fever, typhoid fever, diphtheria, etc., frequently enter the milk from contaminated water used in washing utensils, or from persons who have been exposed to disease and who handle the milk. Sterilize all utensils and no person who has been exposed in any way to such disease should be allowed about the cows, the milk or the milk utensils.

High bacteria counts affect the keeping quality and healthfulness of the milk. The loss to producers from the production of low grade or inferior quality dairy products is very evident. The business of the producer is not safe as long as these losses continue.

Milk must be clean. Milk must be free from dirt and all impurities. Much of the contamination can easily be prevented if the possible sources of contamination are known. Contamination may come from the interior of the udder, from the animal, from the utensils, from the milker and from the surrounding air.

The producer must carefully study and practice methods which will eliminate contamination at its source; and having learned the use of proper methods diligently strive to maintain a high standard. The production of clean milk for the most part is dependent on clean habits and attitude.

I might say here that too much emphasis is placed on the use of the strainer. If the producer would strive to eliminate all dirt from the milk in the process of milking there would be

less need for the strainer. Many recognize the strainer as a necessary evil which should be eliminated wherever possible. To overemphasize the value of the strainer tends to teach the producer to follow the line of least resistance, in other words, it encourages carelessness.

It is unfortunate that many producers will not meet the sanitary requirements until pressure is brought to bear on them. When conditions at the farm are such that clean milk cannot be produced at all times the source of supply must be excluded from the market. This is probably the most efficient, but surely not the most satisfactory way of compelling producers promptly to comply with the requirements. The distributor realizes that the temporary loss of market means financial loss to the producer and for that reason does not wish to go to extremes to get co-operation unless compelled to do so.

Some patrons are antagonistic because they have to meet sanitary requirements and they place the responsibility for the imposition of those requirements wholly on the distributor when in fact the requirements have been imposed by boards of health and by the demands of the consumer. In the Philadelphia milk shed the producers through the Philadelphia Inter-State Dairy Council co-operating with the dealers have drawn up a self imposed set of regulations and are helping in their enforcement.

The distributor is the producer's agent, obligated to dispose of his product to the best advantage to both parties. The distributor is handicapped when he attempts to sell an inferior product. Any reduction in price made necessary by curtailed sales due to low grade products reflects itself in profits. A high grade product will create a demand for itself and since increased demand is usually accompanied by a corresponding increase in price the effort put forth by the producer receives its reward in higher returns.

There is satisfaction in knowing that one has done his utmost to produce the best article possible with the equipment at hand under the existing conditions. Many times that equipment is inadequate for best results and changes must be made. The sanitary regulations governing the production of clean milk call attention to the defects in equipment, management and methods which when corrected make milk production easier and usually results in a lower cost of production.

The distributor does not wish the producer to be overloaded with unnecessary requirements but does insist that every effort be put forth to give the market that cleanliness which it demands.

The distributor must, at all times, keep before the producer the demands of the market as he is where he can keep his finger on the pulse of the market. The distributor knows that food

value, healthfulness and cleanliness are not the only factors to be considered. The housewife demands also a bottle of milk which will keep a reasonable length of time. She is concerned with the keeping quality of milk.

The keeping quality of milk is dependent upon the bacteria content of the milk and temperature. The producer's problem is to eliminate as far as possible the entrance of contaminating bacteria into the milk and to hold the milk under conditions which will not allow for their growth after they enter the milk. The production of low bacterial count milk at the source insures a longer keeping period.

Milk can be held for long periods at low temperatures when care and attention have been given to methods and cooling. The greatest handicap the average dairyman has today is the lack of proper cooling facilities. In my opinion it is the weakest link in the factors which go to make up the chain.

The distributor and others have worked hard to encourage the producer to put up ice for use in summer, but to no avail. Ice is the best medium for cooling milk—it duplicates Winter conditions in Summer, as the silo duplicates pasture in Winter. Thousands of dollars are lost to the milk producers annually all because the producers have failed to meet their responsibility. The receiver of milk must be on the alert at all times to exclude dirty milk, high acid milk, milk with off flavors and odors from the supply. The farmer today must realize there is a market for salable milk only and the rejection of unsalable milk is for the purpose of protecting the market of the careful producer.

The market demands a clean, sweet, safe and wholesome milk and it is through co-operation between the distributor and producer that the quality of milk desired will be obtained.

A Practical Plan of Ridding the Herd of Contagious Abortion

DR. E. S. DEUBLER, *Superintendent Penshurst Farm,
Narberth, Pennsylvania*

This is a problem on which many world famous investigators have worked for many years, and it is very gratifying to state that much has been learned about this wasteful disease in recent years, and a very good plan, THE PENNSYLVANIA PLAN, has been developed and put into operation by our own State Veterinarian, Dr. T. E. Munce, and his co-workers.

This Plan is being used as a model by many other States at the present time.

My experience with contagious abortion covers the past 25 years and it is my purpose to discuss my personal experience as one dairy farmer to another in the hope that my experiences may help some of you. (Dairy Farming is my Rotary Classification and one of which I am very proud).

In 1902 I left my father's farm in Susquehanna County, first to take a Dairy Course at State College, and later in the year to enter the Veterinary Department of the University of Pennsylvania. In Susquehanna County at that time there seemed to be very little abortion in cattle. I can remember the farmers discussing at the Milk Station a new disease which had broken out in one of the few purebred herds of the district. Later cattle from these diseased herds were sold to some of the neighboring herds and the abortion disease swept through many of the herds to which these infected cattle had been added. My father and his immediate neighbors had never had a case of abortion among their stock, as they raised all of their cows.

At the University it was my great good fortune to come early in close touch with that noted Veterinarian, and Investigator, Dr. Leonard Pearson, who gave me a job caring for some of the experimental cattle with which he was working. Then came my first close contact with Contagious Abortion in cattle. A few years later, Dr. Pearson had developed his experimental work to such an extent that a farm in Delaware County was established, where as many as 200 head of cattle were kept at times. These cattle were secured from many sources and some of them were undoubtedly infected with Contagious Abortion as they lost their calves after being at the farm a very short time and soon after this other cows aborted. Dr. Pearson's treatment of these

aborting cows was to put them together in one stable if possible and then wash daily the external genitals, tail, flank and all portions of the body which had been soiled with discharges. A strong disinfectant was used for this purpose. The vagina of the cow was flushed with an antiseptic solution daily as long as the discharges were plentiful, and later every two or three days for two or three weeks, and then weekly until the cow was free from all discharges, and ready to be bred. She was not bred until it would have been time to breed her had she calved at normal period. The bull was flushed before and after service, and if his sheath became too badly inflamed, he was given a furlough and another bull used. Following this treatment which was carefully and consistently carried out on a large number of cows, nearly all of these cows carried their next calf when they conceived, but quite a number did not conceive promptly. This treatment was used in quite a number of other herds, with about the same results and we felt we could control abortion fairly well in a cow after she had aborted once, that is if she would breed again.

We tried many ways of preventing heifers and new cows from aborting. The subcutaneous injection of carbolic acid was standard treatment in those days, and I have injected a lot of it, gave it by mouth and other ways. The results were similar to results from the use of many abortion cures. Sometimes for quite a long period, several months, we would have no abortion and we would think the treatment was giving good results, then there would be several abortions occur in close succession and we found the treatment wanting. The idea was common with many veterinarians and herd owners that when a herd was infected with abortion it was to be expected that almost every cow would abort sooner or later, mostly with the first calf, and in decreasing percentage as they became older.

In 1913 Methylene Blue was heralded as a wonderful successful treatment for the prevention of abortion. The drug being administered by mouth in feed or capsule until all discharges from the cow were well blued. I have used large quantities of this drug, until everything about the barn and farm was literally painted blue, but I could never discover any benefits as to preventing abortion.

In 1914 in co-operation with the State Livestock Sanitary Board, we tried out the Blood Test, and it gave us a great surprise. We found many animals reported positive which had been calving regularly and some of which had never aborted according to the best records available. The owner of one large herd agreed to allow an experiment. This herd has two barns, holding sixty cows each, located 100 feet apart. The blood test showed about one-half the herd positive and the balance negative. So the herd

was divided, the positive animals placed in one barn and the negative in the other. The men who worked in one barn were not allowed in the other. The manure from each barn was taken to the field direct from the barn, the cows were turned in separate lots, and all precautions taken to provide a complete separation. After several months of this, however, more abortions had occurred in the negative barn than the positive, and this coupled with the fact that many of the positive cows were breeding regularly and were believed to have aborted led us to doubt the value of the blood test and the experiment was discontinued. The mistake here and in all of our prior work was in regarding expulsion of the premature foetus as abortion disease and not as but one of the symptoms.

In 1916, the method of Albrechtson for examination of the internal generative organs and the flushing out of the uterus by means of retractors and canula, was demonstrated to us. It seemed that if the uterus, cervix and vagina of cows were carefully cleansed after the cow had calved and before she was returned to the herd, it would be possible to destroy the Bang organisms, which caused abortion and harbored in these organs. We adopted this treatment, and enlarged on it, by providing maternity stalls, where every cow was taken prior to calving and where she was kept after calving until the uterus was washed out repeatedly. This was done with all calving cows and if a cow had aborted or had she retained placenta or any discharge, she was held in the stalls and douchings repeated until uterus and organs were clean. Each stall was thoroughly disinfected after each cow was removed and before another cow was brought in. This treatment I still believe to be of great benefit if carefully carried out. It gives valuable information as to the condition of the organs and as to when the cow is ready to breed. It keeps out infected and discharging cows which would spread abortion and other infections, if they were with the herd. We found the number of abortions and number of new cases materially lessened by this treatment. The danger is that with abortion infected cows in the herd, we are never sure that some of them will not abort in pasture or other places where the highly infected discharge will come in contact with clean cows and infect them.

In 1921, our good friend, Dr. M. F. Barnes, a Veterinarian, whose abortion work is recognized as outstanding by leading veterinarians, called to our attention the value of the blood test in detecting animals which were infected with Bang Abortion Disease. He pointed out our previous mistakes in not making repeated tests, especially in the case of pregnant cows, and when the infection was in an advancing stage. We thought this test would at least do no harm, and would be of value, because we could give

an even more thorough washing of the uterus of positive animals. Therefore, we decided to have blood tests made. In the meantime, the records on several large herds had been carefully kept, and when the blood tests results were studied we were surprised to find that our breeding records showed that most of the positive cows of which there was a record from birth had aborted at some time, even seven or eight years previous to the test, and there was no record of any of the negative cows having aborted for the past 5 or 6 years. Some of these negative cows later aborted, but subsequent tests showed them positive a short time following abortion. This seemed to show the test was of value, and we continued to use it. Test of herds having a negative history of abortion like my father's herd gave absolutely no positive reactions.

At this time it was the custom of Dr. Barnes and his assistants to ask for a full history of each cow, her name and number, at time of each test. This, we of course furnished, but being hard to convince, that the test was all it should be and thinking the history might have an influence on the diagnosis, I determined to test the test or test Dr. Barnes. He agreed to this and I sent him samples from positive and negative cows, sometimes two or three samples from the same cow under different numbers, and he reported them correctly every time. Confidence in the test now re-established, we again divided the large herd previously mentioned, however, keeping the positive cows in one row of the barn, with negative cows in the other row. They were turned in separate pastures, and the positive cows were segregated at calving time. Repeated tests every two months frequently showed one or more of the negative cows now positive, but none of the positive became negative. We were getting too many in the positive row to suit the owner and therefore it was decided to remove all positive cows from the main barn to another farm, completely separated. Barns were disinfected and blood tests made every two months. From this point rapid progress was made. A few more were found positive, from time to time, often a complete negative test intervening, but after all pregnant cows had calved and been tested when open, no more positive cows were found. The positive herd was maintained about two years, in the hope they would become negative but very few did so, some of the cows positive in 1914 were still positive in 1923. Since the prospect of returning these positive cows to the negative herd seemed remote, and the expense of keeping an isolated herd being great, and profits therefrom small, the herd was disposed of. The negative herd has remained entirely negative for three years, and breeding troubles are greatly lessened and profits thereby increased.

The owner has expressed great satisfaction in riding his herd of Abortion, and says all costs were regained by two years increased profits. This herd now numbers 125 cows, and over 100 heifers, bulls and calves, and all are negative to the Blood Test.

I am strongly of the opinion that profits from a dairy herd are almost in direct proportion to the health of the herd, and I think it possible to free any herd of Abortion Disease, if the Pennsylvania Plan is adopted and every feature of the Plan rigidly adhered to. I would recommend that any person interested in Ridding the Herd, secure and study General Bulletin, No. 404, Pennsylvania Department of Agriculture and the circular, The Pennsylvania Plan, which may be obtained from the Pennsylvania Bureau of Animal Industry.

As written directions often seem formidable if not impossible, I will attempt to tell you just how I would go about it, to establish an Abortion Free Accredited Herd.

First number each animal in the herd by tattoo, or some reliable permanent mark of identification. Then make a complete list of the herd showing the tattoo number and complete breeding record as far back as possible. Now secure the service of a Veterinarian who has had experience in blood testing or who at least is open minded and a careful operator. Have him make arrangement with the Bureau of Animal Industry, at Harrisburg, for Blood Testing the Herd. The Bureau will furnish him sterile test tubes, blanks, for listing the animals, with a column for recording the number of the test tube, and another for the tattoo number of the animal.

Then draw the sample of blood from each animal taking care to thoroughly wash the needle between each sample, an experienced operator if given good assistants can easily secure 30 to 40 samples in one hour.

It is one man's work to see that each sample is correctly recorded by number with the herd number of the cow. These tubes are now sent to the State Laboratory, at Harrisburg, for diagnosis and a copy of the list is sent with them. The samples are now referred to by the number on each tube, and if the record is not absolutely correct the test can not mean anything. In a few days the report will come from the Bureau showing which sample numbers were positive and which are negative, and which are suspicious. This is usually accompanied by a recommendation as to when retests should be made. Now if all samples are reported negative, fine, but make another test in a few months, preferably when the most of the animals are open and continue to make tests until the Bureau is satisfied your herd is free, when they will give you a Certificate. *From the time of your*

first test take every precaution to prevent infection from gaining entrance into your herd. This usually comes from a new animal brought into the herd or by the herd coming into direct contact with infected animals.

If the report shows a small percentage of the herd positive, isolate these animals at once, if possible, and consider well if it is not better to get them off the farm. If their breeding record is good and there have been no abortions in the herd, the owner has been very lucky and it is wise not to trust to luck longer.

Retest the negative animals in about two months, and when they are open if possible, *as one test is not to be depended on in case of a pregnant cow.* If the report show a large percentage of the herd positive the problem is more serious as it is more likely abortions have been encountered in the near past, in which case it is quite possible that some of the pregnant cows, now negative to the blood test will abort. The herd should be divided however, and the stables disinfected. Constant watch should be kept for signs of abortion in the negative cows and they should be isolated from the herd at the first sign, no matter how slight. If the cow aborts, remember her discharges are loaded with Bang Bacilli, which will readily infect negative animals, and it is very easy to carry these organisms on the shoes and tools or anything that comes in contact with them. Disinfect promptly, the place where she aborted, and wherever the discharge might be. Burn or bury the foetus as it is loaded with infection and the membranes likewise. *The big problem is to disinfect everything that comes from the uterus of the aborting cow and prevent if from coming in contact with the mouth of a clean cow.* Sometimes it happens that a negative cow will carry her calf full time, and the calf be born alive, but the cow may retain her placenta and a test at this time shows the cow positive. Maternity stalls are a great help in these cases. Stalls should be located out side the main barn, where the herd can not come in contact with them or with any litter that comes from them. If every cow calving abnormally in any way could be retained in a maternity stall until a blood test could be made after her calving, many re-infections of the herd could be prevented.

The whole herd should be retested at least every two months, and reactors promptly removed after every test.

How soon a herd of this kind can be cleared of Abortion depends on how much infection has been broadcast before the first test and how successfully the new aborters can be kept from spreading more infections.

If more than 50% of the herd is positive, at first test, and abortions have been common, it is questionable if it is practical to attempt to remove the reactors. It may be a better plan to carry

the entire herd as a positive herd, and breed from it a clean herd.

Fortunately most calves are born free from abortion infection, even when from infected mothers. They may become infected from their mother's milk, or from her discharge, but more than 95% of calves lose this infection and will test negative before they are old enough to breed, that is if they are kept free from infection after they are taken off a milk diet. It is of course better to take the calves away from the infected herd, as young as possible, and raise them in clean quarters, on non-infected milk. I have however raised calves solely on milk from positive cows and had 98% of them test negative when 18 months old. These calves were not allowed to associate with infected cows after they were two weeks old.

It is often the case that the heifers are all found negative when tested at one to two years old, when the herd was 20 to 30% positive, but the calves had been removed to clean pastures after weaning from milk, and then to clean barns and never associated with infected cattle.

This fact makes it possible for any one to raise a clean herd, if they can keep their young stock away from infection.

An ideal plan is being worked out in a cow test association. First the herds were freed from Tuberculosis. Then Blood Tests were made on every animal in the Association. An arrangements is made when cattle are exchanged so that nothing but negative animals are kept on some farms and nothing but positive animals on other farms. Both groups are benefited by this exchange as far as losses from abortions are concerned. The cows in the positive herds are disposed of as fast as found unprofitable. No calves are raised on the positive farms. This is real co-operation and should enable the members to Rid Their Herds of Abortion with very little expense.

The Blood Test as now made makes it possible to know which cows are infected and therefore possible disease spreaders. Without this knowledge there is no way of completely eradicating abortion disease from our herds. The best time to begin is when the disease is quiet or in an inactive state.

So many herd owners are now applying for tests that the facilities of the Bureau are taxed to their capacity. Pennsylvania now has 49 Fully Accredited Abortion Free Herds and 250 Herds operating under the Pennsylvania Plan. Tests have been made from 800 herds and 25000 blood samples were tested in 1927. The demand for abortion accredited cattle is greater than the supply even at prices approximately 50% higher than untested cattle. The problem of abortion infection from the Public Health standpoint is attracting much attention of late. The losses in an infected herd from lessened milk production and breed-

ing deficiency for two years is usually as great as the cost of Ridding the Herd of Contagious Abortion.

Blood testing, the elimination of reactors, practice of sanitary measures and prevention of re-introduction of the disease is the essence of the only plan known that will completely eradicate abortion disease from a herd.

Should Minerals Be Added to Dairy Rations?

DR. F. B. MORRISON

Director of Agricultural Experiment Stations, New York

During the past few years the mineral requirements of five-stock have attracted much attention on the part of farmers. This has been due to the various striking discoveries made by scientists with reference to mineral needs of animals and in particular to the wide-spread propaganda by various commercial concerns offering mineral mixtures and mineral supplements for sale. Some of the claims made regarding the importance of minerals in stock feeding are entirely well founded. On the other hand many entirely unwarranted statements are seen, even at the present time.

It is therefore highly important that stockmen understand clearly just how much is known concerning the mineral requirements of their livestock. They can then supply any needed mineral supplements at low expense without expending unnecessarily large sums on expensive preparations.

IMPORTANCE OF MINERAL MATTER

Without any question whatsoever, mineral matter is of the highest importance to animals. This is shown by feeding experimental animals rations freed as far as possible from all mineral substances, in which case such animals will die of mineral starvation. Indeed, animals thus fed generally perish sooner than when no food whatsoever is given.

It is believed that in some mysterious way, possibly by carrying electric charges which stimulate the body cells, mineral compounds of the body direct its various vital processes. Furthermore, not only is a sufficient supply of the various mineral salts necessary, but also there must be a proper relationship in the blood between the various mineral compounds. Consequently, in a large measure the kidneys protect the animal against an unbalanced mineral matter content in the blood by promptly excreting any excess of various salts which may be present.

It is only when the food continually furnishes the blood an unbalanced salt mixture that the kidneys may be unable to keep the blood composition normal with resultant injury to the animal. For instance, magnesium and calcium seem antagonistic in their action, and in getting rid of excessive magnesium the body loses calcium. When fed in excessive amounts for a long period, feeds

which contain a high content of magnesium in proportion to calcium, such as wheat bran and middlings, are said to cause a weakening of the bones, leading to such troubles as "bran disease" or "Miller's horse rickets." This, of course, does not mean that bran or middlings are not among our most valuable and healthful feeds when properly fed in combination as a part of a suitable ration.

The common feeding stuffs contain all the necessary mineral salts, at least in small amounts. As a rule, the roughages, except some of the straws, are much richer than the grains in mineral matter. Moreover, the body is probably able to use many of the mineral compounds over and over, taking them back into the circulation after having been once used. Therefore, most full-grown animals which eat a considerable amount of good-roughage usually secure quite a liberal supply of mineral matter, with the exception of common salt. Animals which do not have the capacity of consuming much roughage, such as swine and poultry, show a greater lack of minerals than do cattle, sheep, or horses. Also, dairy cows are more apt to suffer from a lack of mineral matter than are beef cattle, due to the fact that milk is especially rich in both calcium and phosphorus.

SALT SHOULD BE SUPPLIED

The experiments carried on many years ago by Babcock and his associates at the Wisconsin Experiment Station were the first to show conclusively that cattle normally need an additional supply of common salt beyond the amount normally contained in the various feeds they eat. In these experiments, when cattle were maintained on their usual ration, except that no salt was added, after several months injurious effects on their health were readily apparent. They were saved from disaster by supplying salt. More recently, various other scientists have shown the need for salt for other classes of livestock. For example, Evvard, at the Iowa Experiment Station, has clearly demonstrated the necessity of salt in swine rations.

In feeding dairy cattle, it is a wise plan to add one per cent of salt to the concentrate mixture and then supply salt in addition where the cows can have access to it. By this means, the various animals are allowed to take what salt they wish. Adding a small amount of salt to the concentrate mixture increases its palatability.

CALCIUM AND PHOSPHORUS MAY BE LACKING

Since over 90 per cent of the mineral matter of the skeleton consists of calcium, lime and phosphorus, these mineral nutrients may fall short in some rations, especially in those for dairy cows,

which are using a large amount of calcium and phosphorus in making milk, and also for young, growing animals which need an abundance for developing their skeletons.

It is therefore important to bear in mind the relative content of our common feeding stuffs in these two mineral nutrients.

The cereals are all very low in lime, corn containing only 0.4 pounds of lime per ton. The other cereals contain somewhat more lime than does corn, but the content is still very low. Wheat bran is rich in phosphorus, but is very poor in lime, containing only 1.8 pounds per ton. Even such protein-rich foods as linseed meal and cottonseed meal, are only fair in lime content, containing 10.2 and 7.2 pounds of lime per ton respectively. On the other hand, legume hay is rich in lime, alfalfa hay containing 39.0 pounds of lime per ton and soy bean and red clover hay nearly as much. If reduced to a dry basis, skimmilk contains about the same amount of lime as does legume hay.

While the cereals are all low in lime, they are fair in phosphorus content. For example, while corn supplies only 0.4 pounds of lime per ton, it contains 13.8 pounds of phosphoric acid. Wheat and oats are even slightly higher in phosphorus than is corn. Most of the protein-rich feeds are high in phosphorus content. For example, wheat bran supplies 59.0 pounds of phosphoric acid per ton, standard middlings, 42.2 pounds, and red dog flour 40.0 pounds. Cottonseed meal furnishes 53.4 pounds, linseed meal, 34.0 pounds, and soy beans 27.4 pounds phosphoric acid per ton.

Gluten feed and gluten meal, though high in protein, are relatively low in phosphorus. Gluten feed supplies only 13.4 pounds phosphoric acid per ton.

The legume hays, which are so high in lime content, are only fair in phosphorus content, ranging slightly below the cereal grains in this mineral nutrient. For example, alfalfa hay furnishes only 10.8 pounds phosphoric acid per ton.

CALCIUM AND PHOSPHORUS SUPPLEMENTS

The next logical question is "How should calcium and phosphorus be supplied when they are lacking in a ration?"

The best means of furnishing calcium or lime is to provide an abundance of legume hay, in the case of animals which can consume a considerable amount of roughage. This statement obviously excludes swine and poultry, but certainly includes dairy cows.

Well-cured legume hay not only furnishes a large amount of lime, but also supplies some of the vitamin D which is necessary to enable animals to assimilate and use the lime and phosphorus in their food.

Mineral supplements furnishing lime are ground limestone, marl, and even wood ashes. Limestone high in calcium and low in magnesium is to be preferred to a high magnesian or dolomitic limestone. However, investigations by Hart at the Wisconsin Experiment Station, have shown that for cattle and swine even a dolomitic limestone will produce good results, providing the magnesium content is lower than the calcium content. Obviously, the actual value of a ground limestone as a mineral supplement would depend upon its calcium content, a high calcium limestone being worth correspondingly more, ton for ton, than a low calcium limestone. In experiments with poultry by Hart and Halpin, at Wisconsin, dolomitic limestone has not given as good results in poultry feeding as the high calcium limestone.

Since ground limestone may be used as a mineral supplement to furnish the additional calcium or lime, it is obvious that one need not go to much expense to provide such a supplement. On the other hand, a phosphorus supplement is considerably more expensive than a calcium supplement.

Most commonly, some form of bone meal is used when it is desired to add phosphorus to a ration. The best form of bone meal is one which is prepared exclusively for feeding purposes, as fertilizer bone meal commonly has a vile odor and may contain injurious substances produced in the decomposition which has taken place in such fertilizer bones. Bone black, a by-product of the sugar refinery, is also a very satisfactory phosphorus supplement, containing slightly less phosphorus than does steamed bone meal.

Ground rock phosphate has been often recommended for use as a mineral supplement. In certain experiments, this has produced satisfactory results, but in others the ground rock phosphate has proved injurious to livestock. This injury is apparently caused by the relatively high fluorine content of ground rock phosphate, which ranges from 1.5 to 3 per cent.

In view of the injury which may result from ground rock phosphate feeding, its use for a mineral supplement for livestock is not advised.

Acid phosphate, or superphosphate, such as is used for fertilizer, has given good results in feeding trials with swine, carried on especially by the Indiana Experiment Station. In the manufacture of acid phosphate from ground rock phosphate, most of the fluorine is driven off by the sulfuric acid used. This may explain why acid phosphate has given better results than ground rock phosphate.

Recently there has come on the market a mineral supplement, sold under the trade name of "Fos-For-Us". This is a phosphorized limestone, occurring along with ground rock phos-

phate in certain phosphate fields. "Fos-For-Us" contains much less fluorine per hundred pounds than does ground rock phosphate, carrying only about 0.6 percent. However, the content of phosphorus is also much lower than is the case in ground rock phosphate. By computation it will be found that "Fos-For-Us" contains just about as much fluorine to each pound of phosphorus as does ground rock phosphate.

This product has apparently given good results in several instances in poultry feeding. However, before it would seem wise to recommend it for general use as a mineral supplement in livestock feeding, it would be desirable to have available the results of extensive investigations to determine whether or not any injurious results may be produced by the content of fluorine.

MINERAL REQUIREMENTS FOR MILK PRODUCTION

It has long been known that milk is rich in mineral matter, especially in calcium and phosphorus. However, up to a few years ago it was assumed that when dairy cows were fed common, well-balanced rations containing plenty of protein and a liberal amount of legume hay, there could be no deficiency in either calcium or in phosphorus, for legume hay is rich in calcium, and protein-rich feeds are in general high in phosphorus.

Surprising results were, however, secured in extensive experiments at the Ohio Experiment Station by Doctor Forbes. In these trials high-producing cows have been fed such excellent winter rations as alfalfa or clover hay and corn silage for roughage, along with corn and such high protein concentrates in addition as wheat bran, cottonseed meal, linseed meal, dried distillers' grain, or gluten feed.

On these rations, which have always been considered ideal for dairy cows, in most instances the animals lost calcium, phosphorus, and also magnesium from their bodies, in spite of the fact that the feed they were given supplied what would appear to be ample amounts. For some reason or other, the cows were unable to assimilate and retain enough of the liberal supply of these mineral nutrients in their feed to meet the heavy requirements in producing the large amount of milk they yielded.

Even when abundant amounts of calcium, or both calcium and phosphorus, were added to their ration in such forms as steamed bone meal, calcium carbonate, or calcium lactate (a soluble form of calcium), the losses of these mineral constituents from the body continued. The reason for this little-expected condition is still a problem. Possibly the milk producing capacity of our dairy cows has been so increased by selective breeding that it exceeds the ability of high-yielding cows to assimilate sufficient mineral nutrients from their feed to meet the heavy

demand in producing the large flow of milk during the first part of the lactation period. Later on in lactation or when they are dry, they are able to build up again the stores of these mineral constituents in their bodies.

In extensive experiments at the Wisconsin Experiment Station by Professor Hart and his colleagues, it has been found that dairy cows are able to assimilate calcium much more completely from fresh green feed than from dried forage, such as hay. Furthermore, well cured alfalfa hay is superior to that improperly cured. These trials indicate that the best way of curing hay is to cure it in the bright sun, getting it into the barn as soon as it is dry enough, by means of using the side delivery rake, hay loader, etc. Hay cured by such a method will contain the maximum amounts of vitamins.

All this work on the mineral requirements of dairy cattle is so recent that we do not yet know just how far-reaching the results may be in practical feeding. These various trials, however, emphasize the importance of pasture and other green forage for dairy cows during the growing season, and of furnishing an abundance of legume hay during the rest of the year. Also the cows should be dried off six to eight weeks before freshening, and during this time should be so fed that they will be in good condition at calving. This rest period will give them an opportunity to rebuild the store of calcium and phosphorus in their bodies, which may have been depleted by the drain of milk production.

PRACTICAL POINTERS ON MINERALS FOR DAIRY COWS

On account of the great importance of supplying cows plenty of minerals, it may be well to summarize very briefly and definitely the recommendations with reference to this matter:

In the usual dairy ration there is more danger of a lack of calcium than there is in phosphorus. This is because most of the common protein-rich feeds are also rich in phosphorus. This includes wheat bran in particular and also wheat middlings, cottonseed meal, and linseed meal. Gluten feed, germ oil meal (corn germ meal), brewers' grains and distillers' grains are not especially high in phosphorus.

When 20 per cent or more of the concentrate mixture or grain mixture consists of wheat bran, wheat middlings, linseed meal, or cottonseed meal, the cows will get plenty of phosphorus. If less of these high-phosphorus feeds is fed, it is best to supply additional phosphorus by adding bone meal, as stated later.

A large production of milk and thrifty calves are an impossibility if there is a lack of calcium in the ration. The best way of furnishing plenty of lime is to grow and feed an abundance

of alfalfa, clover, or soybean hay whenever it is possible. All legume hays are rich in lime. Furthermore, well-cured, green colored hay, cured in the sun, contains the vitamin which animals need to enable them to assimilate and use the calcium in their feed.

If poor roughage must be used, such as hay from the grasses (not legumes) corn stover grown on acid soil, or straw, add 3 to 4 pounds of ground limestone, wood ashes, or dried marl to each 100 pounds of concentrate or grain mixture. Preliminary experiments indicate that dolomitic limestones, which are high in magnesium may be used satisfactorily as a source of lime.

If there is not 20 per cent of high-phosphorus feeds in the concentrate mixture (wheat bran, wheat middlings, linseed meal, and cottonseed meal), it is best to use 3 to 4 pounds of bone meal or spent bone black with each 100 pounds of the concentrate mixture, instead of using the limestone, wood ashes, or marl. Bone meal and spent bone black supply both calcium and phosphorus, while limestone, wood ashes, and marl furnish lime, but practically no phosphorus.

If plenty of alfalfa, clover, soybean or other legume hay is fed, then there may possibly be no advantage in adding a calcium-rich mineral supplement to the ration. However, even with legume hay available for winter feeding, it can do no harm and may do good to add one of these lime carriers to the ration.

In many mixed feeds for dairy cows, there are now included one per cent of ground limestone, one per cent of bone meal, and one per cent of common salt.

This seems to be a sound practice, considering the fact that most dairy cows do not secure an abundance of legume hay.

FEED CALCIUM SUPPLEMENTS ON PASTURE

Fresh, green crops contain an especially large amount of vitamin needed to enable animals to assimilate calcium. Therefore, the best way of replenishing the calcium in the cow's body, which may have been seriously depleted by high milk production during the winter feeding period, is to feed a calcium-supplement when she is on pasture. Therefore, it is especially important to mix one of the calcium-rich supplements with the concentrate mixture fed to cows on pasture. It is probably best to use more of the calcium-supplement than for winter feeding. As much as 4 to 5 pounds of one of the calcium-supplements may be mixed with each 100 pounds of concentrate mixture. If this mixture should not be very palatable to the cows, the allowance of the mineral supplement may be reduced somewhat.

When the cows are not fed any concentrates during a part of the pasture season, the calcium-supplement may be mixed with salt and the cows allowed free access to it. A mixture of

1-8 salt by weight and 7-8 limestone, wood ashes, marl, or bone meal may be used for this purpose.

GUARD AGAINST GOITER

If trouble has been experienced from goiter or "big neck" in calves, this may be prevented in the future by giving potassium or sodium iodide to the cows through the gestation period. Where there is no trouble from goiter this treatment is not needed.

Lower Production Costs Increase Farm Profits

The cooperative marketing associations through which dairy-men sell their output of milk or cream know that milk from distant points is always ready to be dumped on their markets the moment the price on those markets is high enough to pay the cost of long distance milk hauling. These associations, therefore, aim to secure a price which will return the best possible sum to the members without encouraging the importation of milk from these outside areas.

As a farmers' buying organization, the Eastern States Farmers' Exchange aims to help members reduce the cost of making milk so that they will retain as great a share as possible of the cash received in the milk and cream check.

Eastern States dairy rations are made from ingredients carefully selected and blended to make milk economically. Cow testing associations in which records of milk produced and feed consumed are kept bring out clearly the fact that Eastern States dairy rations are accomplishing the aims sought.

The Eastern States Farmers' Exchange helps farmers reduce costs still further by supplying them with carefully selected fertilizers and field seeds. Eastern States cooperative selective buying service is proving its ability to increase production and to reduce costs of production to more than 22,000 farmers.

For information on Eastern States service write the office.

Eastern States Farmers' Exchange

*A non-stock, non-profit organization,
owned and controlled by the
farmers it serves*

HEADQUARTERS: SPRINGFIELD, MASSACHUSETTS

Dairy Herd Improvement Through the Sire

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Within limits far above the average production of the dairy-herd improvement association cows throughout the United States the high-producing cow is the most profitable cow. Outside of the man consideration, the individual cow is the unit of profit in the dairy business. The principle of volume of business, which is so fundamental in commercial realms, applies equally well to the dairy business, and to the production of the individual cow in particular. Dairying has come to be a competitive business and one in which efficiency of production must receive more and more consideration if competition is to be met in a successful way. Studies have shown that when production per cow is increased from 4,500 pounds milk to 9,000 pounds milk, only 40 per cent more feed is required to secure this additional quantity.

Raising the average production of cows throughout the country has proved to be so practical that it is receiving more and more attention, as is evidenced by the growth of dairy-herd-improvement associations and other forms of testing cows for production. These associations which bring about better management, more efficient feeding, and greater interest in the dairy industry, developed what might be called the mechanical efficiency of the cows or their inherent ability to produce. It is always a good policy to do the best you can with what you have and gradually to raise the standard. Management, selection, feeding and interest in the business, however, have their limits in raising the production of cows; for cows like automobiles are geared to certain points of efficiency, beyond which they can not go. Consequently, if greater efficiency is required a higher geared mechanism must be had.

A problem of great importance to dairy farmers throughout the country, especially those who are members of dairy-herd-improvement associations, where the cows average 65 per cent more than the average cow of the country, is to find some rapid way to obtain cows with greater inherent producing capacity. Taking for granted that everything possible has been done to get the greatest production per cow through efficient management,

the bull is the greatest single factor in rapidly increasing the number of high-producing cows in a community.

A bull properly handled will sire at least 25 heifer calves a year. A cow will have a heifer calf on the average only every two years. The influence, so far as rapidity of increasing cow population is concerned, therefore, is 50 to 1 in favor of the bull. If all bulls had the capacity to increase materially the production of their daughters, it would be a comparatively simple matter to populate the country with higher-producing cows in a relatively short time. However, bulls vary in their ability to increase production. In fact, studies of a large number of bulls being used in dairy-herd-improvement associations throughout the country show that some bulls have decreased production 111 per cent and some have increased production 50 per cent. Figures from dairy-herd-improvement association records show that the bulls bred to cows producing about 4,500 pounds milk, which is the average production of the cows of this country, increased the production of the daughters over that of the dams by 62 per cent in milk and by 67 per cent in butterfat. A study of several hundred bulls owned by dairy-herd improvement association members shows that approximately one-third increased production of their daughters over that of their dams materially, one-third increased the production by a small amount, and one-third decreased production. Studies of about 2,000 bulls used in herds throughout the country show that the average of them increased production of their daughters over that of their dams until the level of about 350 pounds butterfat a year was reached. After that, these bulls decreased production. In Pennsylvania some 3,000 recent records of dairy-herd improvement association cows show the butterfat production to be nearly 300 pounds a year on the average. The surest way to maintain this level and to carry it higher is, in so far as possible, to use bulls which have demonstrated their ability to increase the production of their daughters to and above this level. These facts add a very important feature to the possibilities for usefulness of dairy-herd improvement associations, that is, they show that bulls should be tested for efficiency as well as cows.

A very great opportunity for increasing production of dairy cows, therefore, lies in extending the use of bulls that have demonstrated their ability to increase production. This means that bulls will have to be kept until about 5 years of age before their real value can be ascertained through testing their daughters, and furthermore, it means that the records of both the dams and daughters must be kept.

During the some 22 years of dairy-herd improvement association work in this country, the testing of bulls by comparing

the records of their daughters with those of the dams of the daughters received little consideration until comparatively recently. From records available from a number of States having dairy-herd improvement associations the average life of approximately 200 bulls used in the herds of these associations was shown to be less than 5 years. It is common knowledge that many bulls are disposed of before the production of their daughters is available to determine the real value of the bull.

When the value of bulls is found by comparing the records of their daughters with those of the dams of the daughters, the problem naturally arises as to how they are to be kept alive and used as long as serviceable. It is evident that one breeder can not keep a bull indefinitely even though he were ever so good a producer of high-producing heifers. One great objection raised by farmers and very justly so, is that old bulls grow very dangerous and are a menace. Fire is a menace and certainly will destroy a man's property, but all of us make provision for controlling fire and consequently obtain its benefits. The same principle can be applied to bulls. I think the first step in preserving the lives of meritorious bulls is the providing of a safe place in which to keep them. Safe-keeper bull pens can be constructed so that the meanest of bulls can be kept and handled without danger even to a child. In some States campaigns for safe keeper bull pens have already been inaugurated.

Old bulls must be exchanged, and the bull association work which has made such fine progress in Pennsylvania offers a means whereby farmers in dairy-herd improvement associations may exchange bulls. The bull association principle can be applied to take in wide areas. For instance a man in the northern part of a State who has a bull that has demonstrated his ability to increase production may effect an exchange with a man in the southern part of a State who also has a bull that has similarly demonstrated his ability. Dairy-herd improvement association work makes it possible to test bulls, and the bull associations make it possible, in a practical way, to preserve their usefulness after they are found by testing to be worthy.

The preserving of the lives of good bulls would stop one of the great wastes that exists in the dairy industry.

ANNUAL BANQUET

Pennsylvania Dairymen's Association, Harrisburg, Pa., January

18th, 1928, Masonic Temple

Toastmaster, PROFESSOR E. B. FITTS

ADDRESSES

DR. C. G. JORDAN, Secretary of Agriculture, Commonwealth of Pennsylvania.

DR. R. D. HETZEL, President, Pennsylvania State College.

DR. F. B. MORRISON, Director, New York Agricultural Extension Service.

DR. H. E. VAN NORMAN, President, American Dry Milk Institute
Former President of World's Dairy Congress and of the
National Dairy Association.

Following the addresses awards of prizes for high record milk production were made by the various Dairy Breed Associations, to members of the various cow testing association members, awards for prizes in the milk and butter contests in the Pennsylvania Farm Products Show and ribbons were awarded producers in the Pennsylvania Cow Testing Associations, for those who had obtained herd averages of 300 pounds of butter fat or more, during the past year.

Address of Dr. C. G. Jordan

Secretary of Agriculture, Commonwealth of Pennsylvania

The dairy industry in Pennsylvania stands first among the agricultural interests of the State. The farmers, annually, receive more than one hundred million dollars for their dairy products. This amount will be constantly increased because of the growth of our markets within the State and because of the added demand for dairy products, especially for ice cream. Pennsylvania manufactures and consumes more ice cream than any other State in the Union.

Our herds can be developed both in number and size as thousands of acres used for other purposes are better adapted to dairying and our pastures can be increased or doubled in productiveness through the use of lime and fertilizer. Pennsylvania soil especially responds to such treatment. An abundance of pure fresh water is essential for the success of animal husbandry. No State in the Union in this respect is more favored than Pennsylvania. On almost every farm is a spring or a stream pouring down from the nearby hills or mountains. Our climate also, because of our elevation, is most favorable for dairying.

The value of our dairy herds is rapidly increasing because of the work of our cow testing associations. The small producing cow is being eradicated. Our farmers are learning that it does not pay to put \$1.00's worth of feed into a cow and in return get 90 cents worth of milk or butterfat. In every section of the State cow testing should be encouraged to the limit and should have the hearty co-operation of all dairymen.

The ridding of our herds of tuberculosis is also enhancing their value. It is being conclusively demonstrated that healthy cows are most productive. Fifty-five per cent of the cows of the State have already received the tuberculin test. The work is advancing in a very satisfactory way. If funds can be secured, by 1933 all the cows in the State will have been tested for tuberculosis.

There is some opposition to this work due to lack of information and the spread of unreliable propaganda. The work for the eradication of tuberculosis is not of recent origin and is by no means local in character. It has been in progress throughout the country for years. It has back of it the Federal Government, the Agricultural Colleges and Departments of Agriculture, and Departments of Health, in every State in the Union. About 270 cities, through ordinances, have positively refused to

receive any milk except that coming from accredited herds. In the not far distant future this movement will be universal, as the people are becoming more and more concerned about their health.

In favor of the tuberculin test we have the most outstanding medical authorities of the nation and world. Doctor Mayo, probably the most noted physician and surgeon in the world, has recently stated that in his judgment 25 per cent of the tuberculosis among children and 5 per cent of all tuberculosis comes from the transmission of the bovine tuberculin germ. This comes from his knowledge and experience as a physician and also as a farmer, because he has extensive dairy herds.

A movement so universal and with such universal backing must undoubtedly have a true foundation and must appeal to all men who give it thorough and serious thought in a favorable way. Let us not be carried away by prejudice. Facts must guide and direct us and will direct us to a nation freed from this source of a deadly disease. Over 50 per cent of all the dairy herds in the nation have already been tested for tuberculosis.

The value of our herds is being enhanced also by the eradication of abortion. This work is somewhat new along practical lines, but a practical and scientific method for its eradication has finally been discovered. We are happy to be able to say that one of the men of the Pennsylvania Department of Agriculture, Professor Barnes, has reached an enviable place in the development of the work for the eradication of abortion. He has achieved through his efforts a nation-wide reputation, and in a recent article in the "Country Gentleman" has been placed among the real leaders.

We urge and exhort every farmer to adopt most practical and scientific methods of feeding, breeding, and to join cow testing associations. We also urge all farmers to heartily co-operate with the work of the Department of Agriculture in the eradication of tuberculosis, abortion and all other diseases that may lessen the value of their herds and imperil the health of the people. We are very thankful, indeed, for the almost universal spirit along this line that has been found in our State.

Excerpts From Address by President R. D. Hetzel, Pennsylvania State College

I bring to you the sincere greetings of The Pennsylvania State College and my own congratulations upon the completion of another year of marked accomplishment on the part of the dairy industry. No one could sit in this company and hear the reports and see the evidences of accomplishment and progress without being sensible of the splendid dignity and importance of the dairy industry in the life of the State and without rejoicing in it.

It is a source of peculiar satisfaction to those of us who are charged with any measure of responsibility in the functioning of your State College to feel that we have been privileged to play some small part in this progress. Dairying has ceased to be a routine labor and has become in the finest sense of the word a great business and scientific enterprise.

As we annually review the progress of each year that has passed, we feel that we must have reached the maximum of improvement and still we know that each year brings its measure of betterment and we can therefore enter upon the tasks of the future with reasonable confidence that we shall go forward consistently to higher standards of performance and enlarged prosperity and well being. I think it is fair to say that the greatest single factor contributing to this progress is the ministry of science. It is the use of scientific methods rather than the development of simple skill that has resulted in the improvement of the dairy cow, the refinement of manufactured products and their more efficient distribution and marketing. This being so I believe I can in fairness say that in the same measure as in the past—and possibly in even greater measure—the dairy industry will be compelled to look to the agricultural colleges and the experiment stations of the country and particularly of this Commonwealth for that type of assistance which is now and will continue to be the outstanding single factor contributing to the betterment of dairying and agriculture in general.

In every final crisis and in the sober moments when we are compelled to make an unimpassioned analysis of the sources and the agencies upon which we are most dependent, it is gratifying to find that there is an increasing disposition to lean upon our state colleges and experiment stations. It was my privilege not long ago as a member of the Executive Committee of the Association of Land-Grant Colleges and Universities to hear from a source of highest authority in the government of these United

States the statement that in this chaotic agricultural situation when contradictory and confusing statements and recommendations were being made on every hand those in the position of final responsibility looked with greatest hope and confidence to these scientific educational agencies for exact and honest counsel. It is pleasing to be able to report that this statement resulted in a pronouncement on the part of these colleges made in the form of a report by a special committee and published by the Association which has been pronounced the sanest and most helpful contribution to an understanding of the agricultural problem which has been made in the course of the recent nationwide discussion. I cite this only in support of my contention that in the last instance the people of our Commonwealth will find themselves turning in their time of need with confidence and faith to these great public institutions of learning.

May I call your attention to the fact that the real interests of the State and its people are being served and will be served in increasing measure by these institutions not only in the field of agricultural research and the preparation of trained agricultural leaders and operators but as well in the preparation of youth for efficient service in business, transportation, commerce, manufacturing, finance and every other major interest of our people. These institutions have been so far permitted to make their largest contribution, particularly in scientific research, in the field of agriculture but there is potential possibility of their making equally vital contributions to the prosperity and the well-being of the other great interests of our State. And those of us who are concerned primarily or immediately with agriculture must come to realize that agriculture cannot prosper except as the other interests of the State are permitted to prosper. Furthermore, we should be mindful that in offering opportunity to the youth of the State to prepare themselves for other fields of effort we are again greatly serving our agricultural people because we know that the boys and girls of the rural districts are in surprising numbers entering into the constructive work of the world in other than agricultural lines. In fact, a recent study of the enrollment of boys and girls from our farms who are now at The Pennsylvania State College showed that more than one-half were preparing for other fields of action.

If these things are true then the people of Pennsylvania and particularly those representing the great body of our substantial citizenry, which takes in those of us who have but moderate means must look jealously and even aggressively to the proper support and development of these public service institutions of higher learning. For reasons which I need not now survey the great wealthy Commonwealth of Pennsylvania stands at the foot

of the list of all of the states in the financial support it has provided for its State College on the basis of its resources. It may surprise you to know that in all of the seventy years up to 1926 this State has appropriated to the College for the purchase of land and for the construction of buildings less than \$1,800,000. I believe I am safe in saying that irrespective of resources there is no other state in the Union, not excluding the smallest and least wealthy, which has invested so little in its State College or University.

I have no hesitation in saying to you that at the present time your institution is seriously and sorely handicapped because of inadequate facilities. Its physical plant is seriously inadequate to the demands that are being made upon it and at many points buildings are in use which are positively dangerous to life. Because of these limitations your State College is compelled to deny admission to more than eight hundred boys and girls each year. In some courses we are unable to accept students who are valedictorians of their high school classes. The area of no-man's-land between the public high school and the State College in this Commonwealth is wider than obtains in any other state in the Union. Our State College is unable to respond in any adequate measure to the increasing and insistent demands that come from the people for scientific researches which are seriously needed in the protection and development of the industries of the State.

These conditions, it seems to me, justify me in saying that it is high time that the people of Pennsylvania insist that a proper investment of public funds shall be made in providing for their State institution. And at this point may I call attention to the fact that the greatest opportunity for setting up a physical plant that will be more nearly adequate to the needs of the institution is now before us. At the next general election the people of the State will be permitted to vote on the question of whether or not bonds shall be provided by the State in the total sum of \$8,000,000 for the construction and equipment of the college plant. The bill provides that not more than \$1,000,000 shall be available in any one year. It is reasonable to assume that the careful and efficient development of the building program of the College would require at least ten years. In effect, therefore, this provision, if approved, would mean an investment of state funds in a sum not to exceed \$800,000 a year for a period of approximately ten years. This money would be provided ultimately through the general indirect taxes on corporations, on debts, etc., as is now provided by law.

It is impossible, therefore, to point out definitely the extent of this burden upon any single taxpayer. Probably the most

suggestive statement might be by calling attention to the fact that if the Bond Issue is voted favorably it would mean an increased indebtedness of approximately eight cents per capita a year. In other words, two packages of chewing gum would be equivalent to the per capita cost of this great constructive investment. On the other hand, may I call your attention to the fact that one single experiment in agriculture, namely the discovery of No. 44 wheat, has resulted this year in increasing the agricultural wealth of the State by more than \$2,000,000. As this strain of wheat is more widely used this increase in the wealth of the State will be constantly enlarged; in other words, this one experiment is now returning to the State of Pennsylvania more each year than the State of Pennsylvania is now appropriating to its State College for maintenance and buildings.

I commend these facts to you for serious consideration and in the confidence that they will prompt that kind of championship on the part of the great public of Pennsylvania which is so vital to the well-being of the State and which we, here in Pennsylvania have been more laggard in understanding than have the people of any other state in the Union.

I close with a further expression of absolute confidence in the sound judgment and the generous and sympathetic understanding of the people of our State and particularly of the members of the Association.

Inter-Dependence of Agriculture and Industry

DR. F. B. MORRISON

Director of Experiment Stations of New York,

Our modern civilization has become so complex that most of us do not spend much energy worrying about the other fellow's troubles. We all have problems enough of our own. The average city man may be interested in a general way in the welfare of the farmers of the land. He appreciates in a dim sort of way that his daily life is vitally dependent on agriculture, but he has other more immediate concerns than the net income of farmers as a class.

However, when a milk shortage or other food shortage threatens a great city then the city dweller awakens all at once to the fact that without a steady flow of perishable agricultural products, the dense centers of population would within a few days be facing actual starvation.

Just now we read of intense interest among certain groups of city people in an agricultural matter—the price of beef. For the first time since the post-war agricultural crises the demand for beef has caught up with the supply, and fat cattle have reached a price where they return a good profit to the producers. Naturally this makes beef cost more than in the disastrous years from 1921 to 1926. Beef cattle during this period actually brought less than \$6.00 per hundred weight on the average to the stock men throughout the country. As a result, large numbers of producers went bankrupt. Some thoughtless people are now threatening to boycott beef in order to bring the price down to former levels. They do not stop to consider that the beef producer is just as much entitled to a legitimate profit in his business as they are in theirs.

If it was the world crop of silk that was a little short at the present time, instead of the crop of beef, the reaction of Mr. City Dweller and his wife would be quite different. Perhaps they might murmur a little at the high prices of silk dresses and silk stockings, but they certainly would not boycott these luxuries just because the prices were high. Of course, one reason for this is the growing American tendency to cut down on so-called necessities before sacrificing luxuries. But another reason is that a threatened silk shortage or coal shortage is usually well advertised in the papers, while relatively few know or care about a

shortage in a general farm product until the price of some food advances. Then the commotion starts.

Just such instances as this make it very apparent that there is a need for a general and more popular understanding of the inter-dependence between agriculture and industry.

The average city resident does not yet appreciate this inter-dependence, for he has been experiencing unwonted prosperity at the very time that agriculture has been suffering from a most severe crisis. However, there is now no need to point out this vital relationship to the leaders of city industry and finance. They realize it all too well, for many of them have personally felt the direct effect of the agricultural depression.

In 1921, farmers knew there was an agricultural crisis. Financiers did not realize it until the following years when they saw banks crash by the hundred on account of frozen assets in farm loans. At the same time several of the largest corporations in the country found themselves in dire straits as a direct result of the farm crisis, particularly the manufacturers of farm machinery and fertilizers, the packers, and certain mail order concerns.

As a result of these very visible proofs of the relationship of individual prosperity to farm prosperity, the agricultural situation has recently been much surveyed, investigated, and discussed.

The reports of these agricultural surveys set forth the actual conditions clearly and give all of us very important data to consider. Data which is of paramount importance from the standpoint of the public welfare. Unfortunately, such information cannot compete for popular interest with the most recent murder trials or airplane disasters.

THE PRESENT AGRICULTURAL SITUATION

A report submitted two months ago on "The Agricultural Situation" which was prepared by a special committee of experts appointed by the Association of Land Grant Colleges and Universities sets forth in a very concise form certain of the most outstanding facts regarding present farm problems. In this report, data are given showing the serious manner in which the share of agriculture in the national farm income since 1920 has declined.

From 1909 to 1919 agriculture received not less than 20 per cent of the total income of the country. Since then it has received only a little over 10 per cent of the total national income.

While the wage earnings of the average factory employee were at just about the same levels in 1925 to 1927, as in 1919-20,

the earnings of the average farm family in 1925-26 were only 77 percent of the 1919-20 earnings, and in 1926-27 only 70 per cent. Indeed careful estimates for the agriculture of the Nation show that in 1925-26 farm operators received only \$690 and in 1926-27 only \$627 on the average for their managerial efforts and for their labor and the labor of their families. This well shows the critical situation through which farming is passing.

The report presents an excellent analysis of the causes of the present agricultural situation, which well merits careful reading by any one really concerned with the agricultural welfare of the Nation. In the time available, it will not be possible even to summarize the part of the report dealing with the causes of the present situation.

The main part of the report naturally deals with methods of hastening the improvement in agriculture.

The committee is not despondent regarding the problem of agriculture surpluses, but believes the solution will come through the following means: "adjustments in acreages and numbers of livestock; withholding new land from cultivation until there is need for it; greater use of storage facilities; sound marketing organizations; and unified action in handling such parts of the production of a commodity as may prove burdensome. The movement toward stabilization and control may be hastened by favorable and sound types of legislation."

It is pointed out that there is a great need of a far-sighted land policy, to safeguard agriculture in established farming districts. At present "there is no need to develop more land for agricultural use. No new reclamation projects should be undertaken for a number of years."

Especial emphasis is put upon the tremendous burden taxes have been to agriculture in recent years. "Programs for equalizing the tax burden should be formulated by each state."

Similarly freight rates present serious problems, and there is urgent need for certain readjustments.

While the needs for farm mortgage credit are now being met with reasonable satisfaction, several problems concerning short-term and intermediate credit need attention. Although the problem of obtaining an adequate supply of farm labor is acute in many sections of the country, modification of the immigration laws to alleviate this situation would injure rather than benefit agriculture, it is believed by the committee. It would seem inconsistent to admit additional agricultural laborers to the country, while the chief problem is that there is already a surplus of various agricultural products.

The interest in tariff matters is so general that we may quote the paragraphs regarding this subject:

"Whatever the tariff policy of the nation may be, rates that are effective on agricultural products should be on a level comparable with the levels of those that are effective on products of other industries.

"Careful discrimination should be made between duties which result in higher prices to producers of the commodities on which they are levied and those which bring about little or no increase in returns.

"Since most farmers can not make sudden shifts in their farming programs without incurring serious losses, agriculture is peculiarly susceptible to injury from sudden reductions in duties on farm products. Changes in duties on farm products should be announced long enough in advance of the dates on which they are to become effective, to afford farmers opportunity to adjust their enterprises to the proposed changes."

The authors of the report express firm belief in the soundness of agricultural co-operation as a most important benefit to farmers. They point out the chief obstacles to the growth of co-operation and discuss the methods of overcoming the obstacles.

It is pointed out furthermore that while "many of the problems of agriculture can be solved only by joint action of groups of farmers acting co-operatively, or by legislation, there are many things which individual farmers can do to improve their particular situations". It is often possible to reduce production costs radically by greater efficiency, to produce a product of higher quality, having a greater market value, or to make readjustments in type of farming to meet the present economic conditions.

So much attention has been devoted to the subject of legislation to relieve the present agricultural situation that it may be well to read the concluding paragraphs, which deal with this subject:

"Agricultural legislation is a far broader question than a single act of Congress designed to alleviate the present situation. Any proposal that confuses the minds of the public by encouraging the idea that a single emergency relief act would meet adequately and permanently the difficulties under which the farmer operates is prejudicial to the interest of agriculture.

"Agricultural legislation should provide for equalization with reference to such matters as taxation, tariff, and freight rates, and should provide for a sound land policy and further improvements of credit facilities.

"Agriculture should not be dependent upon legislation to be enacted after emergencies arise, but there should be enacted such broad, permanent legislation as will enable agriculture to meet emergencies as they occur. Its objective should be the advance-

ment of agriculture. Involved therewith may be: Removal of causes of severe agricultural depressions; bringing to bear such temporary action as will minimize the necessity for radical readjustments, and making of provisions which may prevent the severe fluctuations caused by seasonal variations in production.

"It is essential that legislation designed to aid in emergencies should be adopted in advance of such emergencies; that the method of administration and operation should be as simple as possible and free from political bias and political pressure; and that action should terminate as an emergency ends."

THE FUTURE IN AGRICULTURE

The question uppermost in our minds is "What is the future going to hold for American agriculture?" Since I have come to the East only recently, I have been doubly interested in the answer one of the Eastern agricultural leaders, E. R. Eastman of New York, gives to this question in his book just published on "These Changing Times." He heads one chapter "The Future—Would you advise a young man to farm?"

He asks "What about the next twenty-five years? Is the outlook for the farmer better or worse? What is there to look forward to? Is it true, as one city man recently told me, that farming as a satisfactory trade or business is doomed in America? Putting it another way, would you advise a young man or woman to take up farming as a business or as a life?"

The question for those interested in the future of farming is, what about over-production? Is the so-called surplus to continue to beat down the prices of farm products below what American farmers can produce them for and maintain a standard of life comparable with that of the people who live in the cities?

"Experts tell us that judging by the past there will be 150,000,000 people in this country by or before 1950. These facts say in a word, I think, much for the future of American agriculture. In the state of New York alone there are 10,000 miles of improved roads, which will give farmers the opportunity to bring the greatest markets of the world almost to their front yards.

"YES, THE AMERICAN FARMER HAS A FUTURE"

Mr. Eastman then goes on to point out that the successful farmer of the future must be a more scientific farmer and a better educated farmer than those of past generations. For men who follow farming as a real profession he sees an optimistic future—a reasonable income and a creative useful life.

In this view of the future I fully concur.

The Three-Legged Stool of Big Business

DR. H. E. VAN NORMAN

President, American Dry Milk Institute

My remarks are predicated on the assumption that there is much which the individual farmer can do to increase his own prosperity; that while we are waiting for Congress to legislate prosperity into the lap of all farmers it will pay to give more attention to what the individual can do to help himself, that he and his neighbors can do to help themselves.

Second, that most of our progress as well as our own discontent is due to what we see the other fellow do and have; when he prospers more than we do we covet his prosperity.

Third, the earnings and prosperity in our cities which are the envy of agriculture, the admiration of foreign nations, the footabll of political discussion, are it seems to me, the direct product of three great general factors which for want of better terms I am calling the "three legged stool of big business".

Taking them up separately, first is group effort under the leadership of a superior individual. Second, is volume or mass production. Third, is modern cost accounting methods made possible by trained men and mechanical conveniences.

Enlarging on number one, let us first recognize some things that are. We are living in a land of individual liberty and opportunity. Social position, religious belief, financial station, legislative enactment do not doom any man to the position in which he may have been born. The peasant may become the financial plutocrat. Farmer or lawyer may attain public office and social position. But these, and many other differences, do not mean that we are individually endowed with equal ability or equal probability of attaining wealth, position, or power. We are given the equal right to make, each for himself, the most of all of our natural endowment, education, and opportunity. Having recognized these fundamentals, go a step farther. An army has many privates, fewer but nevertheless many captains, some generals, but only one commander-in-chief. A factory has many workmen, some foremen, fewer superintendents, but only one manager. Politics may be democratic, but leadership in business is autocratic. Success in business, as in war, depends on quick decision, without debate after the decision is made. Pershing and Haig subordinated their leadership to Foch to win the war.

A high government official with whom I was discussing the distribution of talents and wealth once said that he had noticed that in the average county blessed with a county agent and a farm bureau organization about one-third of the farmers in the county will join a farm bureau. Another third will look over the fence and copy the better practices. The last third are hopeless.

My own organization has about one-third of the possible membership, but this one-third produced more than two-thirds of all the dry skim milk made last year. The same principle runs through every industry and organization.

One, American business and industrial accomplishment is due first to group effort and leadership by a superior individual. Every factory, mercantile establishment, railroad, and bank is but a group of individuals. A group of capitalists furnish the money, a different group of workers do the work, though in many cases the workers are becoming capitalists, (stockholders in the enterprise) and success is proportionate to the skill of the leadership. Ford is reputed to employ 80 odd thousand workers who, on the average, earn more money, have better homes, more radios, more victrolas, more automobiles, more education, because they are members of the Ford group under Ford leadership. General Electric Company is supposed to have some 65,000 employees. Its present leader is Owen Young, a member of the Dawes Commission. The Pennsylvania Railroad employs over 185,000 workers. Its leadership is General Atterbury who has distinguished himself not only in railroading but in his foreign army service. He is but one of a long line of distinguished presidents of that great corporation. The Continental and Commercial Bank of our City has 2,200 employees. Marshall Field's great retail store has 9,000 employees.

So on through a long line of illustrations can I emphasize the thought that American business and industry is group effort. The conspicuous success accomplished by these and many others has been due to the leadership of the unusual individuals. You may say that I have picked rare exceptions, but the principle holds good all down through the long line of effort. Is the biggest store, bank or factory in your town a one man establishment or a group?

Let us go outside this field. We think of medicine as a group of extreme individualists and yet Mayo Brothers have assembled a great staff of 200 medical men. Doctor Kellogg of Battle Creek has another great group. In my own city many of the most eminent men in medicine whose names are widest known for their skill and ability have associated with them groups of men. No great lawyer, I think I am safe in saying, maintains an individual office, with only his own stenographer, but rather he is a member

of a firm, a group of lawyers with a large staff of clerical assistants. It is true you can go through our city and find the one-man, or rather the one family, delicatessen shop, one-man grocery shop, one-man shoe repair shop, one-man doctor, but the wealth and prominence that attract comment are almost if not invariably associated with group effort.

But here is one of the most important points I would like to make. These groups are lead by superior individuals. Not by men who have set themselves up with self-esteem, not men of mediocre attainment to whom big salaries have been paid, but rather the leadership is the survival of the fittest—the superior individual in a strenuous competition of efficiency.

Marshall Field became the leader of his company, selected by his associates because of his outstanding ability. Morgan has just been chosen head of the U. S. Steel Corporation, as Gary was before him, because his associates recognize outstanding ability to perform a service that is needed, if the group is to succeed. Every individual in the group earns more because of this leadership.

Group effort needs two things which agricultural groups have often lacked, which merchandising, banking, railroading and manufacturing have long enjoyed. Namely, experience in selecting men for high places; second, groups of men of known record of performance from which to select their leaders. As agricultural group effort grows older and succeeds, both of these things must come to it.

Returning now to agriculture, we are not lacking for illustrations of successful group effort. As one of the earliest examples, a group of a hundred farmers, more or less, in a neighborhood made more money out of their milk when they selected a skillful buttermaker to churn it at a creamery than they could make when churning it in a hundred homes. Not but what an occasional individual made better butter and secured a higher price, but in general the creamery effort was the more profitable for all.

Our co-operative fruit organizations are an illustration of group effort. The cow test association in a community is another group effort, but I think I am safe in saying that those groups of agricultural men who have succeeded most conspicuously are those who have been fortunate in choosing leadership skilled in the performance of those duties on which success depends. Agriculture's failure in group effort, in a large majority of cases, has, I think, been usually accompanied by lack of dominant leadership with a proved background of efficiency in the task undertaken.

The second proposition, mass production or volume. We need not leave our own field to emphasize this point. Years ago

in a western state I ran across a creamery with four thousand patrons, with an average of $3\frac{1}{2}$ cows per head, and the butter the creamery was making sold for 6 cents below market. When I suggested improved methods, the manager said the farmers make so blank little milk that if you suggest any improvement they will tell you to go to —if you don't like the milk, they will keep it home and feed the pigs. They had so little of it the pigs could consume it without fear of indigestion. And yet the creamery made better butter and got a higher price for it than those farmers could have gotten each with the little dab he would have had if he had churned it himself. So here again volume counts.

The man with five cows may not afford cement floors in the milk house, but the man with forty cows cannot afford not to have them. In one California community, one creamery received 400,000 pounds of milk a day, produced within 6 miles of the creamery. Farmers milk 50 and 100 cows, and 200 cows, and have average production per cow per head of 3, 4, and in a few cases as high as 5 hundred pounds of butter fat, average for every cow in the herd. Why? Because the volume of business he does justifies him in doing those things which make for profit. That's why the orange growers of California, the apple growers of the northwest, the poultry growers of the Pacific Coast are able to put their products into the New York markets at prices which return profit which the 5-acre orchard and the 50-hen poultryman cannot hope to equal. Volume permits the best methods of production, permits the best methods of preparation for market and justifies search for a profitable market. A great city may not be interested in 10 dozen superlative eggs. It's hard to find the man who will pay a premium for them, but let 10 carloads come into the New York market and every egg distributor in the market is interested.

Again, in our own field, the man with ten or fifteen cows who feeds, cares for and milks them himself rarely is disposed or has time or energy to conduct that cost accounting work which is possible when 20 farmers get together and hire a man who will give all his time to finding out what each cow in the community is doing, what she costs, and what she returns. In other words, enough volume of cost accounting, to warrant the employment of an expert with tools and facilities to do it right.

The modern co-operative movement, it seems to me, is but a groping for the fruits of group effort in marketing. There is room for increased returns by group effort in production and cost accounting.

I want to emphasize my belief that there is a very large opportunity for increased profit by extending group effort to the production side of many agricultural products.

ACCURATE COST ACCOUNTING

The third point, accurate cost accounting. The margin of return between what good farmers are getting and what the "average farmer" is getting is so great in almost every branch of agriculture, that the opportunity is tremendous for the exercise and employment of skilled leadership by groups of farmers.

Cost accounting has been a vital factor in making our great business possible. Our railroads figure cost of moving freight to the second and third decimal point of a cent per ton per mile. The International Harvester Company, and all great manufacturing establishments, figure their cost per unit of every part to the fraction of a cent. The great department and chain stores know their costs to the most intimate detail. It is said that Carnegie, once asked the secret of his great success, pointed to his cost accounting department and the comparisons it made possible as his reply.

Ever since I can recall, 30 odd years ago, farmers have criticised the Agricultural Experiment Stations for showing them only how to produce more crops and other farm products instead of how to make more money. The last few years have seen an aggressive effort on the part of our educational institutions to discover the business science of farming in addition to the chemical, physical, bacteriological, mechanical, and other sciences of agriculture. To lower the total cost of producing the product 10 or 20 cents per unit is to add that much to profit.

It has been pointed out that the cow that yields 300 pounds of butterfat per year produces it at a feed cost of about half that of the cow which yields only 150 pounds butterfat per year.

Studies already made show that it costs one milk dealer 1 cent per quart to handle milk through a certain process that costs another dealer 4.2 cents, while a certain delivery expense varies among dealers from 1.4 cents to 4 cents per unit.

Referring again to the cow, every state has herds, like that reported from Virginia, where half the herd (18 cows) produced no profit whatever. In fact, the milk sold did not pay for the feed, while the best half of the herd (18 more cows) made a respectable profit even at unsatisfactory market prices for milk.

Illinois reports the results of seven years' cost accounting on the same farm. The better managed ones earn 9% on their investment, while the least profitable produced a trifle over 4% on their investment—more than 100% difference in net income.

On some farms, 24 acres per horse were worked, while on other farms, only 18.6 acres per horse were worked, nearly 25%

less work per horse for the same cost of capital and expense. They figure this item alone made a difference of \$900 a year on the labor income of the farm.

Another state reports the difference in the human labor requirements per acre on different farms to be 38%. Again there is a difference of 15%, just in the cost of harvesting and hauling the crops from the field on different farms.

Wisconsin reported on two groups of farms of similar size and location a labor income varying from \$318 to \$819 each, while in the same community the same kind of farms failed to break even, running behind from \$259 to \$1858 each. Similar facts are available to show that there are great possibilities for increased profits by lowering cost of production on individual farms in every state.

Big business pays dividends by keeping its costs below price and fighting for volume of sales.

There is a growing movement to secure cost figures co-operatively.

American business excels in its skill and mechanical devices for accurate cost accounting, which has enabled it to reduce cost and thus meet the other fellow's price. Not only Ford, General Motors, U. S. Steel, the railroads, the centralizer creameries, and all the rest, go to the limit in the use of adding machines, book-keeping machines, to aid in cost accounting, but over 110 industries maintain national trade associations which have worked out uniform systems for keeping their books of costs, so that without revealing to each other their business secrets they can make comparisons of expense details and learn from each other how to further reduce costs. Among such associations are the Tent and Awning makers, the Brick Makers, the International Milk Dealers, the National Ice Cream Manufacturers, and scores of others.

Accurate comparative cost accounting is needed in all cooperative enterprises.

In other words, not only do we need volume of business, but in order to reduce cost, we must have accurate figures, and comparisons to find which are the most efficient methods. I suspect that some day the principle of community cow test associations will be expanded to make the employment of community cost accountants an important factor in increased profits on many farms.

I have no blanket proposal to make the farm income of all farms compare more satisfactorily with city incomes, but I have faith to believe that there is large opportunity for that portion of the farming industry which has courage, initiative and energy to observe how city industries have become prosperous through

group effort, efficient leadership, and cost accounting, and adapt to the different conditions of agriculture, such principles as may add to its prosperity.

Among these, I emphasize greater group effort, not only in marketing, but in production and cost accounting. I emphasize in this group effort the importance of selecting for the leader the superior individual—the man who has proved he is above the average.

Secondly, I emphasize the importance that volume of business pays. Eggs, hogs, fruits, potatoes may be selected and graded and sold on grades when the volume of business is big enough to justify the expense. Returns will not only pay for the cost but increase the profit.

Thirdly, and finally, show the farmer, show yourselves, by accurate, modern cost accounting methods what each business enterprise on the farm costs, and pays. Just as a cow test association member doesn't have to be told what to do with the unprofitable cow, the modern farmer will not have to be told what to do with those enterprises which do not show a profit.

SPRING SESSION

Pennsylvania Dairymen's Association

May 6th, 1927

STATE COLLEGE, PA.

SPRING MEETING OF THE PENNSYLVANIA DAIRYMEN'S ASSOCIATION

MAIN BUILDING, OLD CHAPEL

State College, Pa.

MAY 6, 1927, 7 P. M.

PROGRAM

- Mr. and Mrs. Dairy Farmer; Welcome to Penn State.
 Dr. R. D. Hetzel, President Pennsylvania State College,
 State College, Penna.
 Response, R. F. Brinton, Secretary Pennsylvania Dairy-
 men's Association, West Chester, Pa.
- What the College Teaches the Dairy Student.
 A. A. Borland, Head of the Department of Dairy
 Husbandry, State College, Penna.
- New Dairy Legislation—State and National.
 R. W. Balderston, Secretary Inter-State Milk Pro-
 ducers' Association, Philadelphia, Penna.
- The Dairy Industry.
 M. D. Munn, President National Dairy Council,
 Chicago, Ill.
- Soy Beans for Hay.
 J. W. Warner, County Agent, Indiana County, Indiana,
 Penna.
- Now is the Time to Consider Silos and Silage Crops.
 R. H. Olmstead, Dairy Extension Specialist, State
 College, Penna.
- Glimpses of Dairying in Other Countries, Etc.
 R. L. Watts, Dean of School of Agriculture, State
 College, Pa.
- Entertainment: A play "Judge for Yourself".
 Staged by The Philadelphia Inter-State Dairy Council,
 Philadelphia, Penna.

PENNSYLVANIA DAIRYMEN'S ASSOCIATION SPRING MEETING

Held in Old Chapel, State College, Penna.

FRIDAY, MAY 6, 1927

The meeting was called to order by E. B. Fitts, the president of the association, who outlined very briefly its work and activities as follows:

There are a considerable number here who, for the first time, are attending a meeting of the Pennsylvania Dairymen's Association. Possibly a few words as to the place of the organization in the general scheme of things, speaking dairy-wise, may be in order.

This great industry extends, in one form or another, from the remotest farm in isolated locations in our state to the humblest home in the most congested tenement sections of our large cities. Between these distant points lie a large number of dairy groups or organizations, each operating along more or less specialized lines of endeavor. Some of these activities are breed associations, creameries, milk plants, cow testing associations, bull associations, farmers milk marketing associations and milk distributing plants. In many ways these various groups have interests in common and it was to take care of this situation that the Pennsylvania Dairymen's Association came into existence. It provides a sort of clearing house for all matters arising that affect the industry as a whole. In short it is the mouthpiece of the combined dairy interests of the state. Some of its activities are: Attending hearings before legislative bodies, endorsing resolutions to make known the position of the industry on important questions, holding meetings such as this, and generally aiding in the improvement of the industry all along the line. Its constitution states as its object "Organized to advance the General Welfare of the Dairy Industry in Pennsylvania." An annual report is published containing the entire proceedings of the association during the year, a copy of which goes to every member.

Its membership is comprised of individual dairymen in all lines of the industry. The membership fee is one dollar and receipts from this source comprise its sole income. Its officers and board of directors extend an invitation to all persons interested in dairying to join its ranks and thus aid in promoting its work.

Mr. and Mrs. Dairy Farmer We Welcome You to Penn State.

DR. R. D. HETZEL

President Pennsylvania State College

I feel that I have little justification in taking a place on your program for I am still, as my New England friends would say, somewhat of a "foreigner."

Those of you who know of the purpose and extent of this institution realize that there is little occasion for an address of welcome. This is your institution. It is quite natural that you should come here together to do constructive thinking and to make plans for progressive action. You were prompted to come I feel sure with this thought in mind, and the additional one that this is a place of inspiration and a source of help. The institution is here to promote your interest as far as can be.

We realize that you represent a great industry. I am reminded that there is an enormous investment in your business and that its return to the farms of the state is very nearly if not quite one hundred million dollars each year. It is an industry of tremendous importance to our Commonwealth and to all its people. We are glad to have an opportunity to express our appreciation of being in such a partnership.

In the function of the college we are endeavoring to develop it along three general lines; to do intelligent, constructive teaching, to find through the process of research and experimentation new ways for advancing work; and, to make contacts in the field through the extension service. We want to be of service to you. We want you to measure each one of our activities as the extent to which we are successful. We want you to look us over very carefully. We want you to see all the good and evil about us. Our greatest virtue lies in our good intentions.

I hope you will have an enjoyable session and profit greatly through meeting together here but above all I hope your meeting here will help to create a closer friendship and further emphasize the large common interest we have. I wish the association the best of success during the coming year and extend to you all a very cordial welcome.

Response to Welcome

ROBERT F. BRINTON

Secretary Pennsylvania Dairymen's Association, West Chester, Penna.

I assure you, Mr. President, we are greatly pleased to be here this evening. We have anticipated coming together here and having an opportunity of visiting the college.

Our association was organized to advance the general welfare of the dairy industry in Pennsylvania. It is only two years old and yet we feel that real progress has been made in developing this service organization. The expectations of its members have been more than realized and there has been splendid cooperation from the farmers of the state.

We need the assistance and cooperation of the entire college, especially that of the dairy department. We are especially appreciative of your assurance of full cooperation and wish to assure you of our hearty support of this college.

I again wish to thank you for your cordial welcome and to assure you that the Pennsylvania Dairymen's Association greatly appreciates your hospitality.

What the College Teaches the Dairy Student

A. A. BORLAND

Dairy Department, Pennsylvania State College

The young man or woman who comes to Penn State must bring with him or her a few essentials that no institution can supply. He must have a good character; he must have industry, and he must have a fair degree of ability.

As preparation for a college course the student should have a good high school education and if he has taught in the public schools for a few years he will be doubly well prepared for a college course.

First of all the dairy student gets a good general education, including work in English, Mathematics, Chemistry, Physics, Botany, Geology, Psychology and Economics. The first two years' work is largely devoted to general educational subjects and the last two years to technical agricultural subjects.

The dairy course affords opportunities for three different lines of specialization—dairy production, dairy manufacturing and bacteriology.

The Dairy Production Option fits young men for dairy farm management work, the breeding of pure bred cattle, dairy farm inspection, the supervision of dairy improvement associations, advanced registry testing, dairy council work, county agricultural agent work, sales work in dairy barn equipment, dairy production teaching, experiment station research and dairy extension work.

The dairy production option includes instruction and practice in the care, feeding and management of dairy cattle; the study of pedigrees, breeding, and judging of dairy cattle; the development of a profitable dairy herd, the production of clean milk, the growing of farm crops, the treatment of plant and animal diseases, farm power, farm machinery, farm management, fruit growing, vegetable growing and the care of general livestock, such as horses, cattle, sheep, swine and poultry.

The facilities for teaching dairy production include a herd of one hundred twenty-five dairy cattle of the Holstein, Ayrshire, Brown Swiss, Guernsey and Jersey breeds. The herd has been federally accredited as free from tuberculosis for eight years and "Certified" milk has been produced for the last six years. The herd contains a considerable number of high producing cows as well as show animals. Four of the Ayrshire cows are class

leaders in milk and butterfat production, two Jerseys are state champions in production and several Holsteins have each produced over 1000 pounds of butter in a year. In spite of the fact that the herd is used primarily for instruction and research work, the whole herd of seventy-six milking cows last year averaged 9440 pounds of milk, 382 pounds of butterfat, \$344.64 net returns above the cost of feed per cow. The herd is housed in a modern dairy barn. The college farms include about 1900 acres of land and various departments maintain extensive orchards, gardens, herds of beef cattle, sheep, swine and poultry, all of which are used for instruction purposes.

The Dairy Manufacturing Option fits young men and women for positions in commercial plants or for teaching and research work in the pasteurization and handling of market milk, the testing of dairy products, laboratory work in sanitary milk control and plant operation, the manufacture of butter, cheese, ice cream, condensed milk and powdered milk.

The student receives instruction not only in general educational subjects, in milk plant work and in the manufacture of the dairy products mentioned above, but he also receives instruction in the judging of dairy products, dairy chemistry, dairy plant management, creamery equipment, advertising, accountancy, marketing, refrigeration and many other allied subjects.

The facilities for teaching market milk and dairy manufacturing at Penn State are unusually good. A college dairy manufacturing plant operated as a co-operative creamery is in constant operation. It is patronized by over three hundred farmers and does a substantial business so that the student gets his training in a practical working creamery that operates every day of the year.

Since Pennsylvania is the first state in the union for ice cream, with a production of over thirty six million gallons last year and since it is the second state in the union for milk consumption and ranks high in other dairy products the demand for milk plant operators, ice cream manufacturers and other dairy workers is unusually strong.

The Bacteriological Option fits students for Board of Health work, laboratory technicians in dairy, soils, water and sewage work, and for teaching and research work along bacteriological lines.

The bacteriological student receives instruction and practice in agricultural bacteriology, dairy bacteriology, household, hygienic and sanitary bacteriology, zoology, chemistry, plant and animal diseases and many other allied studies.

BLOOD WILL TELL!



Marion Center Jersey Bull Association.

The bull association in Bedford and Indiana Counties offers a striking example of the results that can be obtained from the use of better sires.

Increases of as high as 50% in both milk and butterfat have been obtained by dairymen using bull association sires.

Increased production, better herds, and greater demand for stock are the results produced by using better sires.

The Indiana County Jersey Cattle Club won first place in the contest among county Jersey associations in the State of Pennsylvania. Community work in calf clubs, bull associations and cow testing work was chief factor in obtaining such a high rating for this club.

Jersey sires provide the shortest road to profitable dairying. You can share in the Jersey prosperity by breeding your cattle to a good Jersey bull.

Write now for valuable free booklets on
Jerseys and dairying.

The American Jersey Cattle Club, Dept. S
324 West 23rd St., New York

The facilities for instructional work in bacteriology are excellent, one part of the dairy building being set apart for this purpose.

The dairy course provides a liberal allowance of elective credits so that the student may shape his course to meet his purpose to the best advantage. He may thus pursue a highly technical line of work with most of his studies in dairy subjects or he may follow a broad general course covering the essentials in the whole field of agriculture.

Perhaps one of the best things a dairy student gets at the college is "The Penn State Spirit"—the spirit of good sportsmanship, of fair play—the spirit that makes a man "buck up and play the game"—the spirit that makes a man want to render the largest possible service to his fellow men and to society at large. This is the spirit that is born of the environment of the mountains surrounding the institution, the spirit that has come to be traditional in Penn State men and which perhaps after all is the choicest gift the college bestows upon its students.

New Dairy Legislation, State and National

R. W. BALDERSTON

Secretary Inter-State Milk Producers' Association

The most important item of national legislation of interest to the dairy industry which was enacted by the 1927 Congress was undoubtedly the Lenroot-Taber Bill providing sanitary standards governing the importation of milk and cream into the United States. The act provides that the dairy farms on which such milk and cream is produced shall have adequate equipment and methods satisfactory to the United States Department of Agriculture and that the milk shall meet minimum standards for bacteria and shall come from tuberculin tested cows.

While the act providing funds for its enforcement failed to become a law in the last days of the Congress, arrangements were already being made for temporary permits to be issued covering the importation of milk and cream from Canada. It is expected that the next Congress will make ample appropriations for the enforcement of this act in the future.

The United States Tariff Commission has still before it the matter of increasing by fifty per cent the tariff on milk and cream so as to make the tariff on those commodities comparable to the twelve cent tariff on butter. Evidence has been taken and an investigation made but no action has resulted.

Probably the most important item of dairy legislation in Pennsylvania has been that of keeping on the statute books the present Pennsylvania oleomargarine laws in spite of repeated attempts to amend them in ways which would result in making them impossible of adequate enforcement. Bills sharply amending the present laws have been introduced repeatedly in previous sessions of the legislature and the past legislature was no exception. A hearing was held but the committee was evidently satisfied that the present legislation should not be tampered with. It is recognized throughout the United States as a model oleomargarine law.

As a result of the recent survey made under the authority of the Secretary of Agriculture, there has evidently been an increased interest in the question of equalization of taxation. Apparently, as a result of this survey, a bill was introduced and passed exempting from further taxation the livestock on Pennsylvania farms.

Adequate appropriations for Pennsylvania State College and for the State Department of Agriculture have been very commendable features of the program of the past Pennsylvania legislature and of the financial policy of the present State administration.

Two bills providing sanitary regulations for the production and sale of milk were introduced into the legislature but neither became a law. One, known as the Hess Bill, had the support of a large number of farmers in one section of the State. It provided, among other things, for the legalization of raw milk from herds that had not been tested for tuberculosis.

Another bill, known as the Gelder Bill, was introduced at the request of the representatives of a large number of dairy interests which had worked in conjunction with the Secretary of Health to prepare an act which would enable the State Department of Health to have further jurisdiction in the matter of sanitary regulations governing the production and sale of milk so that minimum standards may be put into effect covering the State of Pennsylvania.

The Dairy Industry

M. D. MUNN

President, National Dairy Council

I am glad to be here at the Pennsylvania State College as I have never before had the privilege of visiting your institution. I realize that in this community, situated as it is in this country place, the young men and women of this great commonwealth who are preparing themselves in such environment for lives of usefulness are indeed fortunate.

The National Dairy Council is endeavoring to spread the knowledge of the value of dairy products and their food value. There is a survey now being made in cooperation between the Bureau of Census and the United States Chamber of Commerce. Looking through the summary reports of the survey of the first city, I found the classification of poultry and dairy products as one item, soft drinks and ice cream as another. With such classification, it is difficult to determine, from the survey, the relative importance of a particular class of food products such as dairy products. These organizations have spent thousands of dollars, in conducting a survey which will be valuable to those engaged in various kinds of industry, one of which is agriculture but have forgotten the importance of dairy products as fundamental in commerce and fundamental in agriculture and above all as fundamental in building young men and women. I could not refrain from telling the group they had made a great mistake.

This is a great industry, and I am sorry I do not have time to say more tonight concerning it. We do know, however, that this industry has now become national in scope, and has become national in the development of the human race. The production and distribution of milk was once local, but is now national.

The delivery of butter 20-25 years ago was local but is now national. The use and importance of dairy products and the fundamental position they occupy in the welfare of the human race are national in scope. It is indeed high time that information be disseminated regarding the importance of the industry and its relationships.

I wish I had the power to impress you men and women with the vital importance of this great industry in its relation to our national life. I wish I had the power to impress you with the great need for its stabilization on a world wide basis. We are so prone to think in terms of individuals instead of collectively. The time has come when we must think of dairying in a broader sense than in terms of just a farm. It has remained for this country to develop the dairy business as an industry.

Soy Beans For Hay

J. W. WARNER

County Agent, Indiana County, Pa.

The most expensive part of a cow's ration is protein. Nitrogen, which is the most important element in protein, is also the most expensive part of a mixed fertilizer.

Any dairyman who expects to make money must plan to grow most of his protein on the farm with leguminous crops. The more protein we have in the roughage the less is required in the grain ration.

The dairyman who is growing all the alfalfa hay he needs and all the silage corn he needs is not interested in soy beans. It is a question whether a good dairyman has any business growing anything but silage corn and alfalfa.

The dairyman who has not brought his farm to the condition of growing alfalfa or whose alfalfa may have frozen out or does not have enough good clover hay or has land that is too poor to grow good oats or whose land is not sufficiently limed even to grow clover will find soy beans to be one of the best crops for his conditions.

Soy bean hay has proven out in several experiments in different states to be a more efficient milk producer than alfalfa hay, in fact soy bean hay is 1.7% higher in true digestible protein than alfalfa hay. According to the Armsby standards alfalfa hay contains 7.1 pounds of true digestible protein per hundred and 34.23 therms of energy. Soy bean hay contains 8.8 pounds protein and 44.03 therms of energy per hundred pounds. Soy bean hay is .1% higher in protein than oats. Timothy hay contains only 2.2 pounds protein per hundred pounds. A ton of soy bean hay therefore contains as much protein as 4 tons of timothy.

Practically all dairymen who have fed soy bean hay will testify that it is greatly relished and that it is a great milk producer.

Many dairymen will profit by substituting considerable of their oats acreage to soy beans. A 40 bushel crop of oats which may be considered average gives 1280 pounds feed. The same acre of land which is capable of producing 40 bushels oats will produce at least 11½ tons soy bean hay. In other words there will be almost 2½ times as much feeding value from the acre of soy beans as from oats.

A farmer who has failed to get a good catch of clover and whose hay will be mostly timothy had better plow the timothy

sod and sow soy beans. The soy beans are sure to make a heavier tonnage of hay and from the protein standpoint each ton of hay will be equal to four tons timothy. We do not need to worry much about the energy side of the ration as any cow which gets plenty of feed will be supplied with sufficient energy.

Soy beans are not a difficult crop to grow, however, there are a few requirements which must be met. The varieties for hay throughout central and most parts of Pennsylvania are Wilson, Virginia, Manchu, Midwest, Elton and several others not so commonly known. Wilson is one of the easiest beans to buy as they are nearly always quoted on the market. The hay from Wilson is not very coarse. Virginia is almost the same as has been a very good bean in several parts of Pennsylvania but the seed is not always available.

Wilson for hay but requires a few days longer season. Midwest The usual rate of seeding is about 11½ bushels per acre. It is better to use more than this amount rather than less. One of the worst enemies of soy beans is Fall Grass or Fox-tail. If the beans are too thin on the ground the weeds have a better chance. The time of seeding is corn planting time or soon thereafter. The ground should be fully as warm as for planting corn. Every precaution should be taken in preparing the soil to kill the surface weeds as weeds are often very serious. The ground should either be plowed considerable time in advance and harrowed frequently or else the ground should be plowed, harrowed and sowed at once.

It is important that the beans be drilled very shallow. Soy beans are like any other beans. The whole bean comes up. The grain drill is the best method of seeding but the hose should be set so that the beans are just covered. Many poor stands can be attributed to too deep seeding.

Soy beans should always be inoculated unless grown on soil which has had soy beans during the past five years. The easiest, surest and cheapest method is to use soil from a soy bean field moistening the seed and sifting in some soil and then mixing so that all seeds have some dirt adhering.

On land which is in a high state of cultivation very little difference can be noted between inoculated and uninoculated seed but on thin land the difference is remarkable. I have seen inoculated beans almost twice the height of uninoculated plants and the color of the uninoculated plants was a sickly yellow. We are also informed by good authority that the beans grown when inoculated produce a higher quality hay. The grain drill should ordinarily be set as for seeding oats.

It is well to use 200 lbs. or 300 lbs. acid phosphate per acre for soy beans. They are benefited by an application of lime if the soil is acid but one of the greatest advantages of soy beans

over legumes is that they will tolerate strong acidity. I have seen an acre of soy beans yield a large load per acre on land which was so poor that the adjoining four acres of oats was hauled in one load.

Perhaps more people do not grow soy beans because they hear about the difficulties of curing than for any other reason. There are seasons in which it is difficult to get the hay properly cured but the hay is so valuable that it is worth the trouble to cure it. There are still a lot of farmers in Pennsylvania who apparently do not realize that tractors, trucks, automobiles and dairy cows do not thrive on timothy hay. It is usually the timothy hay farmer who raises an objection to soy beans on the argument of curing. I have never yet seen a real honest-to-goodness farmer who has said that soy beans could not be properly cured.

The big thing in curing soy beans as in curing alfalfa is to save the leaves. This means that the hay must be handled in the morning before the leaves become too brittle. The modern method of making alfalfa hay using the side delivery rake immediately following the mower and rolling into small, loose wind-rows and turning every two or three days with the side delivery is the best method. The time for cutting is just when the beans are starting to form in the pods.

Soy beans will stand more abuse perhaps than any other hay crop and even though they become as black as your hat and even slightly moldy, cattle, horses and sheep relish them and with apparently no disorder. I know of some farmers who have been three weeks in getting their soy beans cured during bad weather.

When one considers the fact that soy bean hay and especially the leaves are almost equal to bran pound for pound it is evident that a little time can be spent in getting the hay cured. Pennsylvania farmers have gotten so in the habit of growing timothy hay, and it is hard to break a habit, that soy beans are not becoming as popular as one would suppose.

The most valuable features of the soy bean crop are:

1. Its high protein content and value as a dairy feed.
2. Its ability to thrive on very poor soils and on soils which have not been limed.
3. The ease with which the crop can be fitted into a rotation, taking the place of oats or even of a timothy sod where the clover has not wintered through.
4. The reduced amount of labor in a rotation with soy beans. The soy bean stubble can be drilled to wheat or rye without plowing as is necessary with oats stubble.
5. The small investment per acre in growing the crop.
6. The fact that soy beans are a leguminous crop and therefore a soil benefactor rather than a robber.

Silos and Silage Crops

R. H. OLMSTEAD

Dairy Extension Department, State College, Pa.

We are at that time of the year when a great many dairy-men feel that they can make a clear profit on their milk and that it is not necessary to supplement the feeding of pasture. It is true that pasture is a wonderful feed to stimulate the production of milk. The peculiar thing about pasture is that while it stimulates milk production, heavy producing cows will at the same time go down in flesh. One of the reasons for this is the fact that pasture is a succulent feed containing a large amount of water. It is necessary to supplement it with additional feed to maintain the liveweight of the animals.

To continue similar feeding methods through the winter months it is necessary to furnish some sort of succulent feed. Silage has proven to be the most practical and most economical succulence for Pennsylvania and corn has proven to be the best crop for this silage.

A survey of several hundred cows in cow testing association work in Pennsylvania showed that those on silage had produced 1200 lbs. more of milk and 30 lbs. more of butterfat with a profit above feed cost of \$33.00 more than the cows without silage.

In one section of Pennsylvania the farms having silos showed an average labor income of \$430.50 more than those farms without silos. This is an average for four years. It cannot be said that to the silo alone was due this increased labor income but it plays no small part as better livestock, better farmers and silos seem to go hand in hand. Another great advertisement for the silo is that they are found on nearly all the best dairy farms in the state.

Silage is also coming into use as a great summer feed to supplement short pastures or where there is not sufficient pasture to carry the cows all summer. It is more economical and less bother than arranging for a series of soiling crops during the summer months and having to cut them each day.

Glimpses of Dairying in Other Countries

R. L. WATTS, Dean

The School of Agriculture, State College, Pa.

Perhaps the best dairy products which we received during our trip around the world were on board the ships. In every instance the cheese was of the highest quality, and we had first-class fresh milk on board the Empress of Canada across the Pacific Ocean. The butter served on all ships was of the finest quality.

In Japan we saw many cattle drawing carts or small 4-wheel wagons, but in no instance did I see animals which looked like good dairy breeds.

At Lingnan University there is a fairly good herd of Holstein cattle. The milk produced is probably as good as the average, though the animals are not in good flesh, due primarily to the extremely hot weather and lack of suitable forage crops. Animal parasites are more numerous in that region than northward. Lingnan University has a fine herd of Chinese water buffaloes and Indian water buffaloes. The Chinese water buffalo gives less milk than the Indian buffalo but it is much richer in quality, the percentage of butterfat being about 10 per cent. The milk of the water buffaloes is mixed with that of the Holstein cows at the University and in this way milk of very high quality is obtained.

We saw some excellent cattle on the University farm near Manila, and also a fine herd of White Indian cattle.

No cows were observed in Syria and only a few in Palestine.

At the American colony in Jerusalem, there is a very good herd of improved native cattle. The milk was of high quality and the animals appeared to be healthy and well nourished.

We saw many herds of sheep and goats in both Syria and Palestine. Both classes of animals are used extensively for the production of milk.

In Jerusalem we saw mixed herds being driven about the streets and milked into pails supplied by the customers. This seemed to be the usual method of delivering milk in Jerusalem.

Water buffaloes are fairly common in Egypt, and we also saw native cattle of large size that did not have the appearance of being good dairy breeds though, no doubt, some of them gave considerable milk.

In Egypt all of the cattle are either tied to stakes in the pasture or are kept under control by watchmen. A very fine clover, *trifolium alexandrinum*, is generally grown and, no doubt,

produces forage of the finest quality. All of the land in Egypt is irrigated from the Nile and the soil is very deep, rich and productive.

I presume that all of the cleared land in Switzerland is suitable for grazing and we saw some very fine Brown Swiss animals. A few goats were also seen pasturing on the hillsides.

On our trip around the world we greatly missed good milk such as is now so universally served in America. I believe that the undernourishment of many people in the Orient is due largely to the lack of milk.

"JUDGE FOR YOURSELF"

By Members of the Quality Control Department of The Philadelphia Inter-State Dairy Council



"Judge for Yourself", a mock trial, was presented at the Annual Banquet of the Pennsylvania Dairymen's Association by members of the Quality Control Department of the Philadelphia Inter-State Dairy Council. This play has been developed by the Dairy Council in connection with its educational program to improve the quality of milk in the Philadelphia Milk Shed. It has been shown at dairymen's gatherings throughout that territory in a series of country meetings held by the Dairy Council in co-operation with the Inter-State Milk Producers' Association. It was also staged in Chicago, Ill., for the American Institute of Co-operation.

"Judge for Yourself" features the pertinent points in production methods. Bill Shiftless is on trial charged by the citizenship at large of injuring the milk market by shipping milk which is not clean and up to the high standards set by his fellow-dairymen. The chief witness appearing against him is Jessie, his cow.

In a series of amusing situations Shiftless is shown to be guilty of neglect in washing his milk pails, straining the milk and even of not building a milkhouse. Jessie adds her own accusations to the list. She has not been fed the proper kind of foods which would enable her to produce the largest quantity of milk. The barn was often swept at milking time, with the consequent pollution of her clean product. When the verdict is finally reached, the jury, comprised of the audience, overwhelmingly voted him guilty. The leniency of the judge places the penitent Shiftless upon probation—subject to the approval of Jessie, his cow.

Milk and Butter Awards

Pennsylvania Farm Products Show

List of winners in all classes in the Dairy Products Exhibit, Pennsylvania Farm Products Show, Harrisburg, Pa., January 17th-20th, 1928.

There were 183 samples exhibited, exceeding last year's total by 37.

MILK**Raw Milk from T. B. Free Herds**

Roy Peterson.....	Franklinville.....	Huntingdon Co.....	98. 6
Norman C. Maule.....	Quarryville.....	Lancaster Co.....	98. 5
Mary Carter.....	Pocopson.....	Chester Co.....	98. 5
Morris Kurtz.....	Oxford.....	Chester Co.....	98. 5
J. Iden Smith.....	New Hope.....	Bucks Co.....	98. 4
Mart W. Wade.....	West Grove.....	Chester Co.....	98. 4
Gilbert Smith.....	Curryville.....	Blair Co.....	98. 4
J. Raymond Arnold.....	Hellem.....	York Co.....	98. 4
George Ewart.....	Avondale.....	Chester Co.....	98.35
Saucona Farms.....	Bethlehem.....	Lehigh Co.....	98.35

RAW MARKET MILK

John H. Fry.....	Lancaster R. 2.....	Lancaster Co.....	98.20
Chas. R. Henderson.....	Glenmoore.....	Chester Co.....	97.75
Ross A. Claycomb.....	Imler R. 1.....	Bedford Co.....	97.70

CERTIFIED MILK

Delchester Farms.....	Edgemont.....	Delaware Co.....	98.70
Penshurst Farms.....	Narberth.....	Montgomery Co.....	98.00
Frederick Taylor.....	Palaski.....	Lawrence Co.....	97.30
Bell Farms.....	Coraopolis.....	Allegheny Co.....	95.35
Lenkebrook Farms.....	Harrisburg.....	Dauphin Co.....	83.45
Hernes Groves.....	Baeburn.....	Westmoreland Co.....	82.50

PASTEURIZED MILK

Supplee- Wills-Jones Milk Co...	Philadelphia.....	Philadelphia Co.....	98.00
D. R. Hess.....	Lancaster.....	Lancaster Co.....	97.85
W. W. Barnum.....	Smethport.....	McKeen Co.....	97.50
J. E. Harshbarger.....	Altoona.....	Blair Co.....	97.20
J. W. Ferral.....	Williamsport.....	Lycoming Co.....	96.00
Connellsville Co-operative Dairy	Connellsville.....	Fayette Co.....	95.35

FARM BUTTER

Mrs. C. M. Schwab.....	Loretta.....	Cambria Co.
John E. May.....	Dover.....	York Co.
C. E. Koppenheffer.....	Halifax.....	Dauphin Co.

CREAMERY BUTTER

Hershey Creamery Co.....	Chambersburg.....	Franklin Co.
Fairmount Creamery Co.....	Pittsburgh.....	Allegheny Co.
Greenville Dairy Co.....	Greenville.....	Mercer Co.

Special Awards

Numerous special awards by the various interests within the industry were made as follows:

Special award of a silver cup was made by the American Jersey Cattle Club to W. C. Raudolph, Royersford, Pa.

The Pennsylvania Federation of Holstein Friesian Clubs, presented a silver medal to Saucona Farms, Bethlehem, Pa.

The Philadelphia Inter-State Dairy Council presented an award of a Stewart clipping machine, for the best sample of milk produced by a farmer holding a Permanent Permit, issued by the Dairy Council, to Roy Peterson, Franklinville, Pa.

The Pennsylvania Guernsey Breeders Association presented a silver cream cup to Hill Girt Farms, Cossart, Chester Co., Pa., while the Dairymen's League, Inc., presenting a clipping machine to Roy Peterson, Franklinville, Pa.

Roy S. Bowers, of the Wellsboro Cow Testing Association, with the highest producing herd of Holstein-Friesian cattle, was awarded a silver loving cup by the Holstein Friesian Federation of Pennsylvania.

A LIST OF Cow Testing Association Members WITH Herds Averaging Five or More Cows Which Exceeded the Goal of 300 Pounds of Butterfat Average During 1927

HERDS AVERAGING 400 POUNDS OR MORE

Owner	Address	Av. no. of cows	Breed	Lbs. milk	Lbs. B'fat	County
Fairacres Farm.	Sewickley.	6.83	R.H.	10094	495.9	Allegheny
Roy S. Bowen.	Wellsboro.	7.92	R.H.	15500	490.9	Tioga
L. A. Zimmerman.	Lehigh, R. 1.	21.17	R. G.H.	14462	489.9	Carbon
Wm. Steigerwalt.	Lehigh, R. D., No. 5.	13.92	R. G.H.	13058	479.7	Carbon
C. E. Hoyt.	Sabula.	12.67	R. J.	8939	474.0	Clearfield
L. O. Hetrick.	Mahoning, R. D.	7.25	G.G. R.G. R.H. G.J.	9617	460.1	Clarion
River Ridge Farm.	Franklin.	7.83	R.J.	7709	458.6	Venango
Paul C. Gible.	Mechanicsburg, R. D. No. 6.	7.75	R.H.	13346	457.1	Cumberland
Jesse E. Kurtz.	Carlisle, R. D. No. 8.	9.58	R.H.	13413	452.6	Cumberland
Fred L. Stahlman.	New Bethlehem, Star R.	5.25	R. G.G.	8786	445.1	Clarion
W. F. Calhoun.	Brockway, R. D. No. 1.	5.92	G.H. G.G. G.J.	10869	443.4	Jefferson
Allen Eshelman.	Everett, R. D., No. 4.	11.58	R. Gr. J.	8841	442.9	Bedford
Geo. W. Campbell.	Keister.	9.50	R.J.	7674	439.1	Butler
E. J. Cunningham & Son.	Mifflintown.	12.58	R. G.H.	12642	439.0	Juniata
Elmer Lydic.	Commodore.	6.33	R.J.	7700	438.4	Indiana
H. H. Cooper.	Ulysses.	8.58	R.J.	8504	437.6	Potter
Adelbert Seeley.	Canton.	10.17	G. R.H.	12215	437.2	Bradford
J. W. Adams.	Sugar.	6.58	R.H.	12665	436.6	Sullivan
Ivo V. Otto.	Carlisle, R. D., No. 6.	18.50	R.H.	12937	436.2	Cumberland
Ford E. Smith.	Greenville, R. D., No. 49.	7.92	R. G.J.	7429	431.7	Mercer
Wm. H. Landis.	East Greenville.	18.75	R.H.	11994	428.9	Montgomery
D. A. Morrow.	Tyrone.	8.50	R.G.	8647	426.7	Blair
R. G. Williams & Son.	Canton.	12.67	R.H.	11982	426.6	Bradford
R. W. Sampson.	Crooked Creek.	13.67	R. G.H.	12210	421.3	Tioga
Sam M. Yoder.	Allensville.	10.25	R. G.H.	12339	420.7	Mifflin
J. B. Byler.	Allensville.	9.75	R. G.H.	11990	419.7	Mifflin
Albert Arnold.	Brookville.	6.00	R. G.G. G.H. G.J.	8777	418.7	Jefferson
Polk State School.	Polk.	104.85	R.H.	12071	418.1	Venango
G. W. Hauenstein.	Waymart.	15.17	R. G. J.	8316	417.3	Wayne
H. A. Robinson.	Seelyville.	7.50	R.J.	8139	417.3	Wayne

Owner	Address	Av. no. of cows	Breed	Lbs. milk	Lbs. B'fat	County
Wm. R. Brown.	Delta.	14.42	R.H.	12151	415.4	York
Abram N. Lehman.	Carlisle, R. D., No. 2.	10.58	R. G. H.	12108	415.3	Cumberland
Clarence Moose.	Pleasant Mount.	10.17	R.H.	11496	414.1	Wayne
Harrington & Co.	Dushore.	9.75	R.H.	12139	412.6	Sullivan
S. O. Snedeker.	Waymart, R. D., No. 1.	17.08	R. G.J.	8042	411.8	Wayne
Lawrence E. Buck.	Ulysses.	16.33	R.H.	11408	411.7	Potter
Ward C. Krape.	Bellefonte.	11.00	R.H.	11838	410.3	Centre
Webster Griffith.	Ebensburg.	21.25	R. G.G.	8515	410.2	Cambria
John S. Wohlwend.	Salina.	8.53	R. B.S.	10358	410.0	Westmoreland
John Doane.	Powell, R. D., No. 1.	24.50	R. G.H.	9748	409.7	Bradford
R. L. Carter.	Rush.	17.00	G.G.	8163	409.4	Susquehanna
Clarence Granell.	Ulster.	8.83	R. G.J.	6967	409.6	Bradford
C. M. Barker & Son.	Ulysses.	12.17	R.A.	9614	408.9	Potter
E. C. Howell.	Wellsboro.	7.17	R.H.	11294	407.8	Tioga
Arley Day.	Forksville.	9.25	G.G.	8413	407.4	Sullivan
Leon Day.	Forksville, R. D.	6.83	G.G. G.H. G.S. G.B.S.	9945	407.1	Sullivan
H. A. Freed.	Racine.	6.58	R. G.H.	11339	405.3	Lawrence
Albert E. Madigan.	Towanda, R. D., No. 2.	12.17	R. G.H.	10466	403.7	Bradford
J. Walter Rupp.	Mechanicsburg, R. D., No. 5.	12.67	R. G.H.	11410	403.1	Cumberland
Farmhill Dairy.	Sewickley.	10.00	R.G.	8074	403.1	Allegheny
R. H. King.	Belleville.	9.00	R.H.	12281	401.6	Mifflin
H. A. Snyder.	Montoursville.	16.42	R. G.H.	10845	400.6	Lycoming
R. H. Flening.	Alba.	19.92	R.H.	11052	400.4	Bradford
L. J. Thomas.	Susquehanna.	5.25	R. G.H.	9627	400.3	Susquehanna
Francis and Sheldon Kerrick.	Towanda.	18.17	H.	11567	399.7	Bradford
R. G. Erk.	Prompton.	27.42	R. G.J. R. G.H.	8671	398.2	Wayne
Ralph Gilgrist.	Harrisville.	9.00	R. G.J.	7162	397.7	Butler
John W. Burket.	Tyrone.	9.25	R. G.G.	7996	397.5	Blair
Warren State Hospital.	North Warren.	73.33	R. G.H.	11599	396.9	Warren

HERDS AVERAGING 350 TO 400 POUNDS

Owner	Address	Av. no. of cows	Breed	Lbs. milk	Lbs. B'fat	County
C. M. Miller	Towanda, R. D., No. 8.	15.00	H.	11704	393.2	Bradford
Thomas Doyle	Dushore	8.67	R. G. H. G. G. G. J.	10606	393.2	Sullivan
Paul N. Lehman	Carlisle, R. D., No. 2	13.08	R. G. H. G. G.	10364	392.4	Cumberland
Ralph Rohe	Dushore	12.59	R. G. H.	11315	392.3	Sullivan
Robt. Bamford & Son	Midway	20.50	R. J.	7454	392.1	Washington
Ardarra Herd, Inc.	Sewickley	5.83	R. S. R. J. R. G. H.	9853	391.5	Allegheny
D. R. Butler	Knoxville	10.67	R. G.	8068	390.4	Tioga
M. A. Herber	Breinigsville	5.92	R. G. H.	11072	389.3	Lehigh
H. P. Starr	Valencia, R. D., No. 2	9.92	R. G. H.	10031	389.1	Butler
Fred Erway	Wellsboro	13.08	R. H.	11824	386.9	Tioga
H. K. Benner	Vicksburg	8.75	R. G. H.	11608	386.4	Union
P. F. Morris	Charleroi, R. D., No. 1.	11.75		7680	386.4	Washington
A. C. Hartle & Bros.	Bellefonte	9.42	R. H.	11439	384.6	Centre
H. K. Kraft	Newport	7.00	R. G. G.	7002	384.1	Perry
C. I. Degen & Son	Mifflintown	8.75	R. G. H.	10836	383.7	Juniata
J. A. Young	Williamsport, R. D.	14.17	R. G. H. G. G.	10432	382.6	Lycoming
J. A. Poorbaugh	York, R. D., No. 3	25.17	R. G. G.	8183	381.4	York
W. S. Erdley	Lewisburg, R. D., No. 3	10.33	R. G. H.	11392	380.9	Union
L. G. Wilson	Valencia, R. D., No. 1	13.17	R. H.	10814	379.1	Butler
Harold Ziegler	Wescosville, R. D., No. 1	8.83	R. G. H.	10771	379.0	Lehigh
H. E. Cleland	Imperial	13.75	R. G. H. R. G. J.	9048	378.6	Washington
H. B. Hetrick	Mahoning, R. D.	6.08	G. J. R. G. G.	6668	377.9	Clarion
Burton McLean	Lehighton, R. D., No. 1	12.00	R. G. H.	10624	377.8	Carbon
E. G. Summy	Mt. Pleasant	13.17	R. G. H.	10587	377.5	Westmoreland
B. R. Byler	Allensville	7.42	R. G. H.	10030	377.0	Mifflin
R. W. Gorham	Wysox	15.00	R. H.	10600	376.9	Bradford
P. C. Moser	Lewisburg, R. D., No. 4	9.00	R. H.	10995	376.8	Union
D. E. Tracy	Troy, R. D., No. 4	12.83	R. G. J.	6506	376.6	Bradford
H. K. Stephens	Newport	8.42	R. G. H. R. G. G.	11202	376.3	Perry
Carl L. Smith	McAlisterville	12.75	R. G. H.	10546	376.4	Juniata

Owner	Address	Av. no. of cows	Breed	Lbs. milk	Lbs. B'fat	County
Gale Gerow	Wellsboro	10.92	R. H.	11488	376.2	Tioga
J. E. Ivins	Feasterville	12.58	R. H.	10077	376.1	Bucks
Alex Martin	Bakertown	13.08	R. G. H.	10863	375.6	Butler
T. R. Auker	Mifflintown	10.50	R. H.	11636	374.2	Juniata
Charles F. Edgar	Renfrew, R. D., No. 2	7.67	R. G.	7829	374.2	Butler
Ursinus College	Collegeville	14.50	R. H.	10834	374.0	Montgomery
J. P. C. King	Summerville, R. D.	5.92	R. H.	11216	373.9	Clarion
George Rosoner	Aldonville	10.75	G. J.	7795	373.6	Wayne
A. P. Irwin	Chadds Ford	10.67	R. G.	7741	373.0	Chester
W. F. Hauenstein	Waymart, R. D., No. 1	17.42	R. G. J.	7504	372.8	Wayne
Harry Wilkinson	Wellsboro	26.67	R. G. H.	10964	372.3	Tioga
Harley Osborne	Waterford	11.08	R. G. H.	10883	372.3	Erie
A. M. King	Mercer	13.67	R. G. J.	6886	372.3	Mercer
O. O. Stoyer	Greenville, R. D., No. 49	10.75	G. G.	6638	372.3	Mercer
A. K. Hummer	Titusville, R. D., No. 2	29.17	R. G. H.	9570	372.2	Crawford
Wm. Irwin Co.	Big Run	6.00	R. G.	7268	371.7	Jefferson
E. Raymond Shughart	Carlisle, R. D., No. 9	7.58	R. G. H.	10850	371.1	Cumberland
J. C. Belles & Son	Harmony	10.67	R. H.	11656	370.7	Butler
W. F. Barkley	Livermore	12.17	G. G. G. J. G. H.	7742	370.5	Indiana
J. M. and C. A. Lemon	Saltsburg	13.42	G. H.	9814	370.0	Westmoreland
Geo. L. Snyder	Carlisle, R. D., No. 6	6.42	R. G. H.	10983	369.8	Cumberland
Mrs. C. M. Schwab	Loretto	14.92	R. G.	6767	369.8	Cambria
J. S. Murphy	Woodbine	14.75	R. H.	11000	369.6	York
H. O. Bock	McDonald	12.75	R. J.	7096	369.3	Allegheny
Corlis Buck	Ulysses	10.08	R. G. H.	10309	368.8	Potter
W. W. McMillen & Son	Wampum	8.00	R. H.	10962	368.7	Lawrence
G. D. Barnes	Grove City	9.00	R. H.	10030	368.1	Mercer
H. M. Phillips	Hickory, R. D., No. 1	15.25		10127	368.0	Washington
J. H. Silvis & Sons	Greensburg, R. D.	23.29	R. H. R. J.	9366	367.8	Westmoreland
Dr. F. D. Pringle	Punxsutawney	9.42	R. G. G.	9642	367.7	Jefferson

Owner	Address	Av. no. of cows	Breed	Lbs. milk	Lbs. B'fat	County
Dean Taylor	Grover	22.56	R. J. G.G.	7324	367.6	Bradford
Wm. H. Rupp	Breignsville, R. D., No. 1	10.17	R.H.	10600	367.5	Lehigh
P. C. Shade	Mifflinburg, R. D., No. 3	9.42	R. G.H.	11519	367.2	Union
Wm. Morrow	Tyrone	12.00	R. G.G.	7117	367.0	Blair
T. J. Chamberlain	Munderf.	10.16	R. G.J.	6584	366.9	Jefferson
V. T. Fisher	Portersville	7.58	R. G.G.	8371	366.7	Butler
Fred Bohlayer	Canton	12.00	R.H. G.G.	9897	366.0	Bradford
John Preston	Grover	8.58	G.J. G.H.	8860	365.7	Bradford
George Morgart	Rainsburg	28.00	R. G.J.	7136	365.4	Bradford
T. J. Erway	Wellsboro	12.17	R. G.H.	10239	365.1	Tioga
Theorous Kauffman	Mifflintown	15.17	R. G.H.	11216	364.8	Juniata
State Institution	Pennhurst	100.75	R. G.H.	10330	364.8	Chester
W. M. Hunsberger	Plumsteadville	12.08	R.H.	11053	364.0	Bucks
Harry Clark	Breezewood	9.33	R. G.J.	6997	363.6	Bradford
I. P. Chaffee	Ulster	19.17	R. G.J.	6458	363.1	Bradford
J. W. Seiber	McAlisterville	7.83	R. G.H.	10654	363.0	Juniata
W. H. Price	Williamsport, R. D., No. 3	14.17	G.G. R. G.H.	10269	363.0	Lycoming
Homestead Farm	Honesdale, Box 84	61.25	R. G.G.	7208	363.0	Wayne
Carlyle Wooster	Leolyn	14.83	G.G. G.H.	9604	362.5	Bradford
Curtis Baumunk	Forksville, R. D.	11.58	R. G.H. B.G.S. G.S.	9240	362.5	Sullivan
H. S. Wilcox	Canton	16.25	G.G.	8166	362.1	Bradford
C. M. Bean	Conneautville	17.00	R.H.	10127	361.9	Crawford
J. C. Ray	Hickory, R. D., No. 1	6.75		12202	361.8	Washington
D. G. Grace	Grove City	10.50	R. G.J. G.G.	6548	361.8	Mercer
E. A. McDowell	Grove City	5.67	R.J.	7139	361.3	Mercer
George Erk	Seelyville	29.33	R.J.	6371	361.3	Wayne
Frank V. Rohe	Dushore	6.83	R. G.H.	11048	361.2	Sullivan
C. T. Box	Honesdale, R. D., No. 3	11.00	R. G.J.	6651	360.5	Wayne
J. R. Showalter	Woodbine	29.25	G.H. G.S.	9395	360.4	York
C. D. Stouffer	Port Royal	13.58	G.H.	11132	360.2	Juniata

Owner	Address	Av. no. of cows	Breed	Lbs. milk	Lbs. B'fat	County
J. D. Baker	Grove City	9.00	R.J.	5315	359.9	Mercer
M. D. Lewis	Jamestown	8.67	G.H.	10623	359.8	Crawford
H. Lyle Hess	Delta	10.83	G.S.	7733	359.5	York
J. O. Harding	Brookville, R. D., No. 5	5.75	R. G.G.	7160	359.5	Jefferson
R. C. Jackson	Conneaut Lake	15.25	R.H.	10248	359.4	Crawford
Howard T. Kaltreider	York, R. D., No. 3	6.00	G.G.	7477	359.4	York
Geo. C. Wilcox	Akley, R. D.	10.00	R. G.G.	7905	359.1	Warren
Fred Bishop	Genesee	12.08	P.J.	6916	359.1	Potter
H. K. McCullough	Newville, R. D.	14.58	R. G.G.	7868	358.6	Cumberland
S. D. Warriner	Montrose	19.17	A.	8288	358.4	Susquehanna
John Moffat	New Alexandria	9.75	R. G.G.	8448	358.3	Westmoreland
C. E. Koontz & Son	Lutzville	14.33	R. G.J.	6601	357.8	Bedford
Claude Carpenter	Crooked Creek	15.83	R.H.	9846	357.5	Tioga
Lloyd Snyder	Valley View	14.92	R. G. G.G. G.H.	9348	357.3	Schuylkill
Cordie Allen	Nicholson	14.00	R. G.H.	10349	357.0	Susquehanna
Wm. and C. A. McCauley	New Bethlehem, R. D.	6.50	R.H.	9580	356.5	Clarion
Harold Sargeant	Troy R. D., No. 4	9.33	R.H. G.H.	9540	356.3	Bradford
Elmer C. Ludt	Carlisle, R. D., No. 5	10.67	R.H.	11167	355.9	Cumberland
C. C. Fitch	Westford	20.75	G.G. R.J.	10484	355.9	Crawford
John R. Campbell	Indiana R. D., No. 3	16.00	G.G. G.J. G.H.	8032	355.8	Indiana
Hugh Ferguson	Slippery Rock	23.50	R. G.G. G.J.	7501	355.8	Butler
Auburn Shale Brick Farm	Auburn	16.58	R. G.H.	10127	355.2	Schuylkill
Litzelman Bros.	Dushore	10.92	R.H.	9817	354.9	Sullivan
Clarence Funk	Kimberton	15.42	G.G. G.G.	7375	354.5	Chester
Paul Lindell	Akley, R. D.	14.00	G.H. G.G.	8817	354.3	Warren
Wm. E. Tubach	Dushore	8.50	R.H.	9701	354.2	Sullivan
J. S. Ziegler	Lewisburg, R. D., No. 4	13.83	R.H.	10468	354.0	Union
J. F. Sullivan	New Albany	15.92	R. G.H.	10177	354.0	Sullivan
Howard Plotts	Forkville, R. D.	9.50	R.G.	7034	353.7	Sullivan
Friend Rosener	Aldenville	12.92	R. G.J.	6935	353.6	Wayne

Owner	Address	Av. no. of cows	Breed	Lbs. milk	Lbs. B'fat	County
Lee R. Critchlow	Harrisville	7.67	R. G. J.	6170	353.5	Butler
R. H. Shook	Spring Mills	8.58	R. G.	6924	353.4	Centre
W. J. Erdley	Mifflinburg, R. D., No. 3	12.08	R. H.	10948	353.4	Union
Guy Reed	Summit Station, R. D.	12.17	R. G. H.	10809	353.1	Schuylkill
Cleon Buck	Ulysses	11.17	R. G. H.	10012	353.1	Potter
H. H. Wetzel	Marion Center	6.33	R. G. J.	7005	353.1	Indiana
F. B. Thompson	New Wilmington	18.08	R. J.	6482	353.1	Lawrence
C. E. Mather	West Chester	17.25	R. J. G. J.	7453	352.7	Chester
C. E. Erdley	Lewisburg, R. D., No. 1	15.75	R. H.	11288	352.5	Union
E. D. Deckard	Newport	6.25	R. J. G. H. G. G.	6784	352.4	Perry
Norman K. Beach	Parkesburg, R. D., No. 1	20.25	R. G. G.	7099	352.3	Chester
J. E. Boyer	Lewisburg, R. D., No. 1	7.67	R. G. H.	9912	352.2	Union
Willard Walker	Centerville	10.92	R. G. H.	9738	351.6	Crawford
J. H. Lear	Carlisle, R. D., No. 5	12.67	R. H.	10442	351.4	Cumberland
O. A. Shirey	Linden	16.42	R. G. H.	10416	351.3	Lycoming
Stanley Koontz	Bedford, R. D., No. 4	16.08	R. G. J.	6895	351.2	Bedford
J. E. Hayes	Rockton	12.42	R. G. H.	9635	350.5	Clearfield
J. L. Fawcett	Campbellsville	6.17	R. G. H. G. G. G. J. G. S.	9339	350.5	Sullivan
G. J. Martin	New Albany	6.58	R. H.	9950	350.4	Sullivan
R. A. Eisamen	Irwin	17.83	R. G. G. R. G. H.	9278	350.4	Westmoreland
Harry B. Shenk	Elverson	30.17	R. G.	6802	350.4	Chester
McPherson Bros.	Clinton	20.17	R. A.	8902	350.1	Allegheny
Leon Torpy	Wellsboro	13.83	R. G. H.	8611	350.1	Tioga

HERDS AVERAGING 300 TO 350 POUNDS

Staunton Farm	Coraopolis	9.67	R. H.	10929	349.6	Allegheny
E. E. Beale	Port Royal	8.25	R. G. H.	10257	349.2	Juniata
I. A. Rockwell	Troy	12.25	R. H. G. H.	9665	349.2	Bradford
Bellwood Farm, Inc.	Bellevue	63.83	R. G. G.	8329	349.2	Allegheny
Dr. R. L. Schaeffer	Fogelsville	20.00	R. G. H.	10873	348.9	Lehigh

Owner	Address	Av. no. of cows	Breed	Lbs. milk	Lbs. B'fat	County
C. W. Grube	Orwisburg, R. D., No. 1	26.00	R. G. H.	8841	348.3	Schuylkill
R. M. Valsing	Wellsboro	13.00	G. H.	9364	348.1	Tioga
Byron Hanby	Knox, R. D.	17.00	G. G. G. J. G. H.	7857	348.0	Clarion
Curtis Allen	Nicholson	13.75	G. H.	10116	347.4	Susquehanna
M. L. Jones	Westtown	98.42	R. G. H.	10064	347.4	Chester
P. C. Antes	Williamsport, R. D., No. 2	18.58	R. H.	10637	347.3	Lycoming
C. K. Hodges	Akley, R. D.	7.25	G. H.	9129	347.1	Warren
Merle Jones	Evans City, R. D., No. 1	6.00	R. G. H.	8744	346.7	Butler
E. H. Karlheim	Patton	5.83	R. G. G.	6498	346.7	Cambria
C. L. Risher	East Brady	20.50	R. G. H.	9318	346.0	Clarion
Linfred Benner	Langhorne	10.67	R. G. H.	9379	345.9	Bucks
C. A. Musser	Oakland Mills	8.42	R. G. H.	9854	345.4	Juniata
Webb Bros.	Fawn Grove	21.08	G. S. G. J.	7417	345.2	York
Blaine Mendenhall	Brookville, R. D., No. 5	21.42	R. G. H. R. G. J.	7777	345.1	Jefferson
Mrs. Mary N. Carter	Pocopson	17.42	R. G. G. R. J. G. J.	6861	345.0	Chester
Merle Ongly	Centerville	9.25	R. H.	10012	344.9	Crawford
Karl A. Fettig	Mifflintown	12.50	R. G. H.	9845	344.7	Juniata
N. I. Wilson	Warriors Mark	10.00	R. G. S.	7931	344.4	Centre
Walton & Boundy	Grove City	10.00	R. J.	6108	344.4	Mercer
R. E. Neely	Muddy Creek Forks	25.17	G. J. G. H.	8241	344.3	York
C. L. Buss	Montgomery, R. D.	9.67	R. G. H.	9381	344.2	Lycoming
Jas. M. Marquis	Hickory, R. D., No. 1	8.83	Hols.	9004	344.2	Washington
John H. Howard	Wyalusing	19.33	R. G. H.	9646	344.1	Bradford
Christ Wagner & Son	Tamaqua, R. D., No. 1	24.25	R. G. H.	10436	344.0	Schuylkill
J. B. Elder	Volant	5.00	R. H.	10585	343.9	Lawrence
A. F. Stroup	Palmerton, R. D., No. 2	25.83	R. G. H.	10161	343.8	Carbon
F. W. Williams	Indiana, R. D., No. 4	7.83	R. G. G.	7363	343.8	Indiana
Fred Shaffer	Forksville, R. D.	11.83	G. H. G. B. S.	7296	343.7	Sullivan
Hugh Ockerman	Troy, R. D., No. 4	13.67	R. J.	6611	343.7	Bradford
Ross A. Corey	Conneautville	16.00	R. G. H.	9277	343.3	Crawford

Owner	Address	Av. no. of cows	Breed	Lbs. milk	Lbs. B'fat	County
Frank T. Krall	East Berlin, R. D., No. 1	12.08	R.H.	10436	343.2	York
Claverach Farm	Downingtown	15.00	R.J.	6563	343.2	Chester
Fred Estes	Union City	13.33	G.D. G.H. Mix.	8431	343.1	Erie
O. W. Butler	Wellsboro	12.42	R. G.G.	7840	343.1	Tioga
U. K. Peachey	Belleville	8.08	R. G.H.	10057	343.9	Mifflin
H. C. Larcom & Son	Milan	12.00	R.H. G.H.	9461	342.8	Bradford
J. Russell Spencer	Pleasant Mount	19.42	G.H.	9351	342.7	Wayne
W. S. Farley	Holicong	22.08	G.H.	9483	342.6	Bucks
F. H. Harjes, Jr.	Valley Forge	14.33	R. G.G.	7184	342.5	Chester
Levi Schultz Est.	Palm	13.92	R. G.H.	9685	342.3	Montgomery
C. F. Willison	Mahoning	5.92	R.H. R. G.G.	7576	341.8	Clarion
Bell Bros.	Imperial	17.00	R. G.H.	10019	341.7	Washington
Jas. E. Meredith	Towanda	14.92	R. G.H.	9273	341.5	Bradford
C. J. King	Mt. Wolf, R. D., No. 1	5.33	R. G.G.	7446	341.2	York
Howard C. Drissel	Saegertown	7.33	R.J.	6860	341.1	Crawford
W. F. Seddon	Barnesville, R. D.	12.50	R.J. G.H.	8287	341.0	Schuylkill
A. L. McCracken & Son	Charleroi	11.00	R.H.	6747	340.2	Washington
L. P. Satterthwaite	Newtown	17.92	R.H.	10098	339.8	Bucks
R. A. Trevehan	Honesdale, R. D., No. 1	19.83	R. G.H.	8850	339.7	Wayne
Walter W. Little	Hanover, R. D., No. 3	11.92	R. G.G.	7297	339.7	York
Mercer Sanitarium	Mercer	14.75	R. G.J.	7034	339.7	Mercer
Allen Burrell	Millheim	8.17	R.H.	10235	339.6	Centre
William B. Rhods	Oakbourne	12.67	R. G.H.	9626	339.6	Chester
B. E. Firth	Russel, R. D., No. 2	10.83	R. G.H.	9238	339.2	Warren
H. H. Reigle	Winfield	8.58	R. G.H.	9897	339.2	Union
Wm. M. High	Phoenixville, R. D., No. 4	19.00	R. G.H.	9894	339.0	Chester
John Reefer	Zelenople	8.67	R.G.	6885	338.8	Butler
Clark C. Pollock	Marion Center	5.67	R.J.	6231	388.8	Indiana
Geo. McCormick	Allenwood	13.50	R. G.H.	9662	338.7	Union
Arthur H. High	Pottstown, R. D.	9.67	R.H. G.J.	9624	338.4	Chester

Owner	Address	Av. no. of cows	Breed	Lbs. milk	Lbs. B'fat	County
E. B. Gillett	Susquehanna	14.92	G.H.	8539	337.6	Susquehanna
K. S. Bagshaw	Holidaysburg	10.00	R. G.B.S.	8085	337.4	Blair
F. E. McEwen	Mercer	16.25	R. G.J. G.H.	7643	336.4	Mercer
Wm. Bohlayer	Canton	20.10	R.H.	9072	336.3	Bradford
R. G. McMurray	Utica	13.67	R. G.J. G.	6737	335.8	Venango
John R. Raudabaugh	Carlisle, R. D., No. 7	15.92	R. G.H.	10055	335.7	Cumberland
H. E. Edeburn	Mercer, R. D., No. 1	10.75	R.G.	6839	335.5	Mercer
C. G. Niesley	Mechanicsburg, R. D., No. 1	16.08	R. G.H.	9751	335.3	Cumberland
Horace Andrus & Son	Col X Roads	14.85	R.H. G.H.	9147	335.3	Bradford
John S. Wehr	Mifflinburg, R. D., No. 3	10.25	R. G.H.	9923	335.1	Union
Mrs. Lottie Bernheisel	Loysville	12.33	R. G.H.	9626	334.9	Perry
Westmoreland County Home	Greensburg	21.25	G.H.	9220	334.7	Westmoreland
H. C. McEwen	Mercer	10.58	R. G.J.	6890	334.7	Mercer
W. J. Karlheim	Patton	6.42	G.G.	6559	344.6	Cambria
Elwin Baldwin	Canton	16.17	R.H. G.H.	8435	334.4	Bradford
Ray Shook	Sligo, R. D.	11.08	R. G.G.	7096	334.4	Clarion
Robert C. Ludwig	Regins, R. D., No. 2	22.67	R. G.H.	9293	334.3	Schuylkill
L. W. Robinson, Jr.	Indiana	6.67	R.G.	6496	334.3	Indiana
G. Smiths & Sons	Seelyville	21.92	R.J.	6097	334.0	Wayne
H. R. Weber	Grove City	8.33	R.H.	9064	333.8	Mercer
H. H. Moll	Millmont	9.50	Mixed	8176	333.8	Union
Henry Noek	Wellsboro	11.58	G.G. G.A. G.H.	7920	333.6	Tioga
W. G. Montgomery	Grove City	9.92	R. G.H. G.G. G.J.	9077	333.0	Mercer
Elmer Frey	Lehigh, R. D., No. 1	21.75	R. G.H.	9456	332.8	Carbon
C. Allen May	Dover, R. D., No. 1	15.83	R. G.G.	6778	332.8	York
Jacob Yoder	Belleville	5.75	G.H. G.J. G.S.	9087	332.7	Mifflin
Geo. Augustine	East Palestine, Ohio	11.25	R.H.	9943	332.5	Lawrence
A. T. Replogle	Woodbury, R. D., No. 1	16.50	S.H. G.J. G.G.	7384	332.5	Bedford
Peck Bros.	Nittany	8.92	R.H.	9736	332.4	Centre
Ottis Rehner	Pine Grove	13.58	R. G.H.	9934	331.9	Schuylkill

Owner	Address	Av. no. of cows	Breed	Lbs. milk	Lbs. B'fat	County
F. B. Sellers, Jr.	Carlisle	6.75	R. G.H.	8425	331.8	Cumberland
John F. Nace	McAlisterville	6.25	R. G.H.	9751	331.7	Juniata
W. S. Grimm	Red Lion	25.92	R.H.	10136	331.5	York
Earl Maurer	Hegins, R. D.	12.42	G.H. G.J.	8245	331.5	Schuylkill
Tresslers Orphans Home	Loysville	28.83	R. G.H. R. G.J.	9207	331.4	Perry
A. D. Beaver	Vicksburg	7.00	R.H.	9150	331.3	Union
M. N. and M. G. Burtner	Butler, R. D., No. 5	16.67	G.H. G.G. G.S. G.A.	7063	331.0	Butler
William S. Ker	Carlisle, R. D., No. 9	6.08	R.H.	10012	330.8	Cumberland
Ward R. Weiler	Mowhawk Ave. Ext.	29.92	R.H.	9017	330.4	Warren
J. S. and J. S. McCormick	Coraopolis, R. D., No. 1	10.17	R. G.H.	8290	330.4	Allegheny
Porter Farms	Phoenixville	36.33	R. G.G.	6385	330.3	Chester
J. W. Bronson	New Galilee	13.42	R.J.	6506	329.6	Lawrence
Warren G. Schultz	East Greenville	13.25	R. G.H.	9269	329.3	Montgomery
Earl Paxson	Schuylkill Haven, R. D.	13.17	R. G.H.	8894	329.3	Schuylkill
Erdman & Son	Elizabethville, R.D.	17.08	R. G.H.	10015	329.0	Dauphin
Floyd T. Smith	Reynoldsville, R. D., No. 5	5.58	R.A.	7594	328.9	Jefferson
E. T. Hendricks	Butler, R. D., No. 1	8.08	R. G.G. G.S. G.J.	7377	328.8	Butler
J. I. Clarke	Port Royal	11.83	G.H.	8746	328.6	Juniata
Paul Koontz	Bedford, R. D., No. 5	8.00	G.J.	7100	328.6	Bedford
Reid F. Wilcox	New Albany	16.42	R. G.H. G.G. G.J.	8669	328.4	Sullivan
E. D. Witmore	North Warren	49.42	G.H.	8250	328.2	Warren
Mrs. Matilda Karlheim & Sons	Patton	12.75	R. G.G.	6776	328.2	Cambria
Peters Bros.	Port Matilda	7.50	R. S.H.	8790	328.1	Centre
S. B. Wasson	State College	17.67	R. G.G.	7016	328.0	Centre
Geo. S. Gehman	Coopersburg, R. D., No. 1	10.50	G. H. G.G. G.A. G.S.	9121	327.9	Lehigh
C. L. Wilkinson	Rushland	13.08	G.H.	9097	327.7	Bucks
Steven Hitchcock	Sugar Grove, R. D., No. 4	14.08	G.G.	6765	327.4	Warren
H. H. Marsh	Waterford	11.32	R.H.	9881	327.2	Erie
James Warren	Wellsboro	14.00	R. G.H.	9026	326.8	Tioga
Lloyd D. Linn	Washington, R. D., No. 9	11.42		9737	326.4	Washington

Owner	Address	Av. no. of cows	Breed	Lbs. milk	Lbs. B'fat	County
A. C. Slifer	Lewisburg, R. D., No. 3	9.17	R.H.	9416	326.0	Union
C. H. Marshall	West Chester	16.83	R.H. R.J.	8195	325.9	Chester
Abram E. Rider	Mechanicsburg, R. D., No. 5	12.67	R. G.H.	9167	325.8	Cumberland
Robert Bryant	Susquehanna S. R.	19.92	R. G.H.	9348	325.6	Susquehanna
Erway Bros.	Raymond	21.50	R.H.	9877	325.4	Potter
G. A. Sherred	Cambridge Springs	8.64	R.H.	11068	325.3	Crawford
R. E. Young	Indiana	10.58	R.H. G.J.	9462	325.1	Indiana
Knarr Bros.	DuBois	19.42	R. G.G.	6201	325.1	Clearfield
U. E. Rhein	Cressona, R. D.	8.42	R. G.J.	6128	325.1	Schuylkill
St. Vincent's Archabbey	Beatty	18.00	R. G.H.	9302	324.9	Westmoreland
Raymond B. Arnold	Milan	20.25	R.H.	8970	324.8	Bradford
Mrs. Alice Slocum	Thompson	10.92	R. G.H.	9459	324.7	Susquehanna
W. P. Hosterman	Spring Mills	5.00	R.G.	5930	324.7	Centre
Wayne Langeworth	Centerville	10.75	R. G.H.	9651	324.5	Crawford
Maurice Smith & Bros.	Mayport, R. D., No. 4	15.00	R. G.G.	6343	324.5	Jefferson
Wm. H. Walton	Ellwood City, R. D., No. 1	6.83	Mixed	7361	324.4	Lawrence
Harry A. Heess	Forksville, R. D.	18.50	G.H. G.S. G.B.S.	7917	324.3	Sullivan
B. W. and J. C. Thompson	Clarion	20.58	R. G.H.	9572	324.1	Clarion
F. M. Kintigh	Irwin	8.08	R. G.G. P.A.	7753	323.9	Westmoreland
John Hershberger	Everett	9.50	G.J.	6248	323.9	Bedford
Owen S. Gerhard	Palm	21.33	R. G.H.	9513	323.8	Montgomery
J. L. Hibbard	Monroeton, R. D., No. 1	8.67	R.H.	9222	323.3	Sullivan
Lee Buchanan	Carlton	9.17	G.G.	6087	323.3	Venango
Taylor McCarty	Sugar Run	14.42	R.H.	8787	323.0	Sullivan
S. C. Miller	Grove City	11.91	R. G.J.	5806	322.4	Mercer
Arthur Bowell	Thompson	12.67	R.H.	9057	322.2	Susquehanna
Jos. Canby & Son	Hulmeville	26.75	R. G.H.	9700	321.9	Bucks
W. I. Reeves	Marshallton	14.75	G.G.	6689	321.9	Chester
H. O. Kimmel	Shelocta	15.00	R.H.	10082	321.8	Indiana
V. S. Caylor	North Point	8.50	R. G.G.	6338		Jefferson

Owner	Address	Av. no. of cows	Breed	Lbs. milk	Lbs. B'fat	County
John O. Wirt	McVeytown	9.08	R. G.H.	8906	321.4	Mifflin
Raymond Stichel	Slippery Rock	6.42	R. G.G. S.J.	6181	321.3	Butler
McClelland Bros.	Canonsburg, R. D., No. 2	21.25	G.H.	10514	321.2	Washington
H. C. Mallory	Waterford	9.75		9061	321.2	Erie
Irwin & Liggett	Rea, R. D., No. 2	31.67		7708	321.0	Washington
Irvin Macaffee	Milan, R. D., No. 3	11.25	G.H.	8581	320.7	Bradford
J. G. Hendricks	Butler, R. D., No. 1	18.42	R. G.G. S.H.	7172	320.6	Butler
J. M. Reno	Grove City	14.85	R.H.	9260	320.4	Mercer
R. F. Brown	Mill Creek	9.83	R. G.H.	9023	320.0	Mifflin
W. L. Barclay	Williamsport	30.53	R. G. G.	8252	319.9	Lycoming
Miss L. T. Morris	Chestnut Hill	11.67	R.J.	5531	319.7	Montgomery
Delaware County Home	Lima	12.83	R. G.H. G.G. G.J.	7991	319.5	Chester
Hartman & Weinberger	Palm	15.58	R. G.H.	8886	319.3	Montgomery
Harry Marshall	Brockway, R. D., No. 1	6.67	R. G.H. G.J.	7866	319.2	Jefferson
C. M. Worley	Mercer, R. D., No. 2	15.17	R.G.	6460	319.1	Mercer
Lewis E. Herring	Pine Grove, R. D.	10.00	R.J.	6794	318.9	Schuylkill
Rouse Hospital	Youngsville	54.17	G.H.	9222	318.7	Warren
Thomas W. Lengle	Pine Grove R. D.	22.00	R. G.H.	8266	318.7	Schuylkill
O. M. Woodward & Son	Pennsburg, R. D.	9.44	R. G.H.	7401	318.5	Montgomery
Belmer Hitchcock	Sugar Grove, R. D., No. 4	14.42	R. G.G.	6244	318.4	Warren
W. R. George	New Bethlehem, R. D.	6.75	G.G. G.J.	6882	318.3	Clarion
J. P. Barkley	Euclid	5.08	R.J.	5995	318.3	Butler
S. E. Raudabaugh & Son	Mechanicsburg, R. D., No. 6	8.50	G.H.	9323	317.9	Cumberland
S. and J. Datt	Valencia	18.25	R. S.H.	9119	317.9	Butler
H. S. Mathias & Son	Irwin	21.00	R. G.G. G.H. R. G.H.	8804	317.9	Westmoreland
Furman H. Gyger	Kimberton	23.92	R.H.	8692	317.9	Chester
J. M. Chittister & Son	Brookville, R. D., No. 2	17.00	G.G. G.H. G.J.	7474	317.8	Jefferson
Vance H. Bell	Imperial	19.50	G.J.	6107	317.4	Allegheny
John E. May	Dover, R. D., No. 4	8.00	G.G.	6219	317.1	York
Michael Rathgeb	Greensburg, R. D.	26.67	R. G.J. R. H.H.	7969	316.7	Westmoreland

Owner	Address	Av. no. of cows	Breed	Lbs. milk	Lbs. B'fat	County
O. P. Walker & Son	Thompson	8.75	R.H.	9650	316.3	Susquehanna
Henry Erb	McClure	6.08	R. G.H.	9160	316.3	Mifflin
P. W. Lawton	Tiadaghton	8.83	T. G.H.	9019	316.3	Tioga
Nichols Bros.	East Smithfield	13.19	Mixed	6476	316.3	Bradford
J. P. Rogers	Forksville, R. D.	7.50	G.G. G.H.	6428	316.3	Sullivan
E. H. Lodyard	Waymart, R. D., No. 1	23.83	G.J.	5913	316.2	Wayne
J. L. Grom	Coudersport	12.33	G.H. G.G.	7416	316.1	Potter
Hall Brothers	Baxter R. D., No. 2	19.50	R. G.J.	6222	316.1	Jefferson
J. Norton Kruger	Carlisle, R. D.	17.58	R. G.G. R.H.	8017	315.9	Cumberland
Orville Rumbaugh	Millerstown	13.42	R. G.H.	8908	315.7	Perry
Charles S. Chaffee	Ulster	19.53	R.H.	8901	315.7	Bradford
Glen Hickok	Canton	10.92	G.G. G.J.	6522	315.6	Bradford
Carl S. Wertz	Greensburg	9.50	R.G.	6279	315.5	Westmoreland
J. I. Smith	New Hope	24.00	R. Gr. G.	6100	315.5	Bucks
S. E. Lee	Bedford, R. D., No. 5	12.53	R. Gr.J.	6026	315.5	Bedford
Allegheny County Home	Woodville	62.08	R.H.	10367	315.4	Allegheny
H. W. Seeley	Knoxville, R. D., No. 2	16.50	R. G.H.	8699	315.4	Tioga
M. B. Bish	Mahoning, R. D.	5.67	R. G.G. G.J.	5898	315.4	Clarion
J. M. Kimmel	Kimberton	13.50	G.G.	6610	315.3	Chester
Frank C. Wilcox	Akley, R. D.	15.92	R. G.G.	6742	315.1	Warren
Ralph Packard	Granville Summit	12.83	Mixed	6974	315.0	Bradford
Boone Bros.	Bellefonte	14.25	R. S.H.	9176	314.9	Centre
L. A. Cease	Troy, Pa.	14.00	R.H. G.H.	9157	314.9	Bradford
L. B. Carter	Titusville	34.17	R.J.	5529	314.9	Crawford
Wm. Barrett	Woodbury	9.53	R.S. Gr.J.	6944	314.7	Bedford
Samuel Cessna	Bedford, R. D., No. 4	16.33	R. G.H.	8738	314.5	Bedford
B. F. Kennedy	Pleasant Mount	16.50	R. G.H.	8471	314.5	Wayne
D. L. Hartzell	Renfrew	11.42	R.H.	8864	314.4	Butler
L. D. Weary	Carlisle, R. D., No. 7	11.53	R. G.H.	9502	314.0	Cumberland
C. J. Taylor	Dallastown	16.08	G.S.	7074	314.0	York

Owner	Address	Av. no. of cows	Breed	Lbs. milk	Lbs. B'fat	County
G. V. Rockwell	Troy	15.17	R.H. G.H.	8474	313.5	Bradford
Oscar Warburton	Overton	20.83	R. G.H.	8618	313.4	Sullivan
William Dibble	New Albany	9.33	R.H.	8664	313.4	Sullivan
W. E. McMeen	Port Royal	14.42	R.H.	9281	313.3	Juniata
W. G. Rimer	Rimersburg, R. D.	17.17	R. G.H. G.G. G.S.	8165	313.3	Clarion
A. J. Yahnor	Patton	9.50	P. G.J.	5601	313.3	Cambria
M. B. Satterthwaite	Newtown	9.08	Gr. H.	9134	312.9	Bucks
George Sloppey	DuBois	6.17	R. G.G.	6388	312.9	Clearfield
R. T. Gaylord	Jamestown	7.67	R. G.H.	9125	312.7	Crawford
J. S. Campbell	Butler	30.75	R.J.	5592	312.7	Butler
Wm. M. Lloyd	Downingtown	25.58	R.J.	6166	312.6	Chester
Homer Webster	Wellsboro	18.00	R. G.H. G.A.	8587	312.6	Tioga
Geo. McMurray	Grandville Summit	8.08	R.S. G.S.	7605	312.5	Bradford
Pride Brothers	care of County Agent	6.83	G.H. G.G.	8318	312.4	Potter
Karl Rockwood	Waterford	15.15	R. G.Hol.	8254	312.2	Erie
Carl Norbeck	Sugar Grove, R. D.	26.58	R.H.	8240	312.1	Warren
Wm. Woolvorton	Alexandria	16.08	R.G.	6229	311.8	Huntingdon
F. F. Resseguie	South Gibson	14.75	R.H.	8790	311.5	Susquehanna
G. Clair Smith	Martinsburg	13.92	G.H.	8672	311.4	Blair
Mrs. W. B. Saunders	Bryn Mawr	18.00	R. G.H.	8251	311.4	Montgomery
S. C. Beeman	Brookville, R. D., No. 4	17.17	G.G.	6701	310.8	Jefferson
Frank J. Murphy	New Albany	13.08	R. G.H.	8459	310.6	Sullivan
John McKee	Canton	25.92	G.J. G.H.	6913	310.5	Bradford
George Colyer	Mifflintown, Pa.	10.00	R. G.H.	8947	310.4	Juniata
S. B. Reed	Reynoldsville, R. D., No. 5	5.92	R.H.	8386	310.4	Jefferson
Wallace C. Pierson	Downingtown	18.67	P.J.	6183	310.3	Chester
Robert F. Brinton	West Chester	30.91	R. G.H.	9149	310.2	Chester
W. B. Kennedy	Wyalusing	21.75	Hols.	8753	310.1	Bradford
C. A. Gamble	Fredonia, R. D., No. 7	9.50	R. G.H.	8945	310.0	Mercer
Blackburn Farm	Sewickley	15.50	R.A.	8235	310.0	Allegheny

Owner	Address	Av. no. of cows	Breed	Lbs. milk	Lbs. B'fat	County
Harrison Grist	Woodhull, N.Y.	15.08	R.H. R.A.	8851	309.7	N. Y.
S. L. Nicholson & Son	Muncy, Pa.	11.75	R. G.H.	8784	309.7	Lycoming
J. Victor Brungart	Smullton, Pa.	9.92	R. G.J.	6362	309.7	Centre
Chas. F. Sundberg	Indiana, R. D., No. 4	11.42	Mixed	7457	309.6	Indiana
C. P. McMinn	Lanes Mills, Pa.	11.50	R.H.	8572	309.2	Jefferson
J. W. M. Gruber & Son	Shippenville, R. D.	14.08	R. G.G.	6555	308.6	Clarion
H. H. Dunkleberger	Winfield, Pa.	5.33	R.H.	9406	308.5	Union
Clark S. Miller	Lewisburg, R. D., No. 3	14.66	R. G.H.	8239	308.5	Union
Giles Thomas	Westfield, R. D., No. 2	14.33	R.H.	8570	308.4	Tioga
C. C. Warner	Corry, R. D., No. 8	35.17	R. G.H. G.G.	7854	308.4	Warren
L. M. Thompson	Montrose	25.50	Hols.	9079	308.2	Susquehanna
Tracey Stone	Canton	13.33	Mixed	6977	308.2	Bradford
Leo Ash	Centerville	8.45	R. S.H.	9518	308.1	Crawford
H. L. Ulsh	New Port	6.50	R. G.H.	7869	308.0	Perry
Henry Supiot & Sons	Phoenix, R. D.	25.42	R. G.H.	8797	307.8	Chester
Albert F. Kost	Carlisle, R. D., No. 7	13.08	R.H.	9544	307.7	Cumberland
Ross Barrett	Mahoning, R. D.	7.25	R. G.G.	6229	307.6	Clarion
Oscar Devore	Thomas, Pa.	18.33	R.G.	8810	306.9	Washington
F. B. Morris	Bristol	29.92	R.G.	6323	306.8	Bucks
N. B. Gabel	Newport	9.33	R. G.H.	8370	306.6	Perry
Glen Swan	Home, Pa.	14.92	R. G.J.	5685	306.5	Indiana
G. E. Groninger	Port Royal, Pa.	14.92	R. G.H.	8179	306.4	Juniata
Mark Porter	Mill Village	18.42	R. G.H.	5917	306.4	Erie
J. C. Fleming	Belleville, Pa.	10.08	R. G.H.	9190	306.1	Mifflin
S. W. Hunter & Son	Mercer, Pa.	10.33	R. G.J.	6091	306.0	Mercer
C. D. Frey	Lehighton, R. D., No. 1	18.50	R. G.H.	8547	305.8	Carbon
M. A. Hayes	Milan	8.67	R.G. G.R.	8759	305.7	Bradford
Jacob B. Meixel	Boiling Springs	8.50	R.H.	9113	305.4	Cumberland
E. G. Ferguson	Millerstown, Pa.	7.50	R. G.H.	7757	305.3	Juniata
George McAllister	Union City, R. D., No. 1	8.42	R. G.H.	7825	305.3	Erie

Owner	Address	Av. no. of cows	Breed	Lbs. milk	Lbs. B'fat	County
Harvey England	Bedford, R. D., No. 4	17.00	R. G.H.	8964	305.1	Bedford
Mrs. Howard Bieler	East Greenville	13.67	R. G.H. G.R. J.G.	8759	305.1	Montgomery
W. C. Boyce	Knoxville	15.50	G.H.	8230	305.1	Tioga
G. B. Wachob	DuBois	10.42	G.H. G.G.	7420	305.1	Clearfield
Earl Wilcox	Canton	7.67	G.J. G.H.	7413	305.0	Bradford
Thomas Cooper	Euclid, R. D., No. 2	18.67	R.J.	5758	305.0	Butler
J. W. Hartman & Son	Sligo, R. D.	8.58	R. G.G.	5975	304.9	Clarion
J. W. Martin & Sons	Bessemer	28.17	R.J.	5610	304.7	Lawrence
S. C. Mitchell	Lewistown, Pa.	6.75	R. G.H.	8643	304.6	Mifflin
Jonathan P. Styer	Glen Moore	13.53	G.H. R.J. G.J.	7879	304.5	Chester
Arthur Bullers	Brookville, R. D., No. 6	8.08	R.G.	5851	304.5	Jefferson
Freeman Gates	Columbia X Roads	7.83	R.J.	5475	304.4	Bradford
G. S. Havens	New Hope	9.00	R.G.	6072	304.3	Bucks
C. H. Gross	York, R. D., No. 10	10.50	G.H. G.G.	8472	304.0	York
H. L. McCurley	Enon Valley	18.67	R.J.	5701	303.9	Lawrence
G. Lloyd Heckman	Mifflintown, Pa.	8.00	R. G.H.	10055	303.8	Juniata
Williams Brothers	Union City, R. D., No. 1	12.25	R. G.H.	8606	303.8	Erie
Harry Lent	Coudersport	10.92	R. G.H.	8084	303.8	Potter
J. S. Keister	Keister, R. D., No. 2	7.00	G.G.	6039	303.8	Butler
Mayes & Confer	Howard	18.58	R.G.	6142	303.4	Centre
Frank Keen	West Chester	26.08	R.H.	8909	303.3	Chester
Paul A. Hugus	Latrobe	29.17	R. G.H. R. G.J.	7342	303.3	Westmoreland
S. H. Markley	Longsburg	11.83	R.G.	6493	303.2	Bedford
A. S. McCullough	Sharpsville, R. D., No. 55	10.67	R.G.	6061	303.2	Mercer
P. J. Stein	Muncy, R. D., No. 4	15.58	R. G.H.	8692	303.1	Lycoming
Joseph M. Conrad	Mechanicsburg, R. D., No. 5	9.17	R. G.H.	8552	303.1	Cumberland
Dale D. Kilgore	Woodbine	10.42	G.S. G.H.	7765	303.0	York
J. S. Briggs	Yardley	15.00	R. G.G.	7279	302.9	Bucks
H. D. Allebach	Trappe	15.17	R. G.H.	8630	302.8	Montgomery
Crawford County Home	Saegertown	12.08	H. G.	8516	302.8	Crawford

Owner	Address	Av. no. of cows	Breed	Lbs. milk	Lbs. B'fat	County
Rynd Farm	Oil City, Pa.	30.83	Mixed	7193	302.8	Venango
Paul H. Lengle	Pine Grove, R. D.	14.17	R. G.J. G.G.	6211	302.8	Schuylkill
J. H. VanTassel	DuBois	10.75	R. G.G.	6700	302.3	Clearfield
George W. Wambaugh	Delta	15.00	G.S. G.J.	7105	302.2	York
W. I. Pierce	Columbia X Roads	13.00	R.H. G.H.	7773	302.0	Bradford
F. H. Ludwicks	Akley, R. D.	16.59	G.H.	8056	301.9	Warren
Jonas Eberts	Andreas, Pa.	24.92	R. G.H.	8549	301.8	Carbon
S. E. Uber	Greenville, R. D., No. 47	13.42	G. G.S. G.J.	6798	301.6	Mercer
M. B. C. Home Farm	Center Valley, Pa.	18.33	R.H.	9134	301.3	Lehigh
John L. Basehore	Mechanicsburg, R. D., No. 5	12.17	R. G.H.	9184	301.2	Cumberland
Birchard Brothers	Montrose	23.50	Jers.	5725	301.2	Susquehanna
A. T. Riegel	Schuylkill Haven, R. D.	19.00	R. G.H.	8701	301.1	Schuylkill
Clyde Vosburgh	Titusville	9.50	R. G.H.	5990	301.1	Crawford
H. L. Stoltzfus	Pottsville	13.33	R.H.	8969	301.0	Chester
W. B. Bennett	Ulysses	19.92	P.H.	8420	300.9	Potter
N. J. Leete & Son	Coudersport	20.24	R. G.H.	8224	300.9	Potter
Salem Frey	Lehigh, R. D., No. 1	12.25	R. G.H.	8009	300.9	Carbon
H. M. Brown	Indiana, R. D., No. 5	17.58	R. G.H.	8887	300.8	Indiana
D. D. Holliday	Canton	16.50	R. J. G.J.	6108	300.8	Bradford
G. L. Kerrick	Towanda, R. D., No. 8	24.33	R. G.H.	8477	300.7	Bradford
A. K. Rothenberger	Lansdale, R. D., No. 1	17.25	R. G.H.	8579	300.5	Montgomery
W. J. Saeger & Son	Slippery Rock	11.00	G.H. G.G. G.J.	6876	300.5	Butler
C. W. Reed	Slippery Rock, R. D., No. 5	10.42	R. G.G.	5804	300.5	Butler
George Shepard	Canton	8.83	R.H. G.H.	9045	300.3	Bradford
Rudy J. Yoder	Belleville, Pa.	19.00	R. G.H.	8675	300.3	Mifflin
J. C. C. Pease & Son	Washington, R. D., No. 4	20.25	R. G.H.	9017	300.2	Washington
C. P. Douthitt	Enon Valley	8.53	R. G.H.	7439	300.2	Lawrence
Harry Campbell	Columbia X Roads	9.83	R. G.J.	6312	300.2	Bradford
C. W. Young	Williamsport, R. D.	16.67	R. G.H.	8647	300.1	Lycoming
Dr. Findley	Altoona, R. D., No. 3	16.67	G.G. R. G.H.	8863	300.0	Blair

Owner	Address	Av. no. of cows	Breed	Lbs. milk	Lbs. B'fat	County
E. Page Allinson	West Chester	35.00	R.H.	8707	300.0	Chester
Burrell Hayes	Edinboro	11.36	G.H.	8536	300.0	Crawford
John McEwen	Fredonia, Pa.	10.92	R.G.H. G.J. G.G.	7480	300.0	Mercer
L. G. Stevens	Harrison Valley	8.00	R.H. R.J.	7152	300.0	Potter
W. E. Rudo	Waymart, R. D., No. 1	23.83	R.J.	5354	300.0	Wayne

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 Geo. Taylor, 58 Dairy Bldg., State College, Pa.
 S. B. Wasson, State College, Pa.
 R. R. Welch, 58 Dairy Bldg., State College, Pa.
 P. S. Williams, State College, Pa.
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 R. F. Brinton, West Chester, Pa.
 C. I. Cohee, Kennett Square, Pa.
 Robert W. Eno, 212 W. Miner St., West Chester, Pa.
 C. Albert Fox, Pocopson, Pa.
 C. J. Garrett, West Chester, Pa.
 Frank W. Graff, Kennett Square, Pa.
 Geo. Hannum, 429 Weshington Ave., Downingtown, Pa.
 Thos. P. Harney, West Chester, Pa.
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 Longwood Farms, Inc., Kennett Square, Pa.
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 Peck Bros., Nittany, Pa.
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 M. T. Phillips, Pomeroy, Pa.
 Oswald Piel, Downingtown, Pa.

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 David Stoltzfus, Elverson, Pa.
 H. C. Craig, Curllsville, Pa.
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 T. H. Bawman, Clearfield, Pa.
 H. B. Duncan, Farm Bureau Office, Clearfield, Pa.
 C. E. Hoyt, Sabula, Pa.
 Knarr Brothers, Dubois, Pa.
 D. T. Mitchell, Jr., Mahaffey, Pa.
 T. C. Kryder, Mill Hall, Pa.
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 M. J. Grimes, Catawissa, Pa.
 G. W. Hack, Berwick, Pa., R 2.
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 John Chisholm, Cambridge Springs, Pa.
 E. W. Hummer, Titusville, Pa.
 Geo. F. Martin, Westford, Pa.
 Lee McCauslin, Titusville, Pa.
 Leo A. McMichael, Conneaut Lake, Pa.
 Merle W. Ongley, Centerville, Pa.
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 W. S. Wise, Meadville, Pa.
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 Abram N. Lehman, Carlisle, Pa., R 2.
 Elmer C. Ludt, Carlisle, Pa., R 6.
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 C. G. Niesley, Mechanicsburg, Pa.
 Ivo V Otto, Boiling Springs, Pa.
 W. H. Pfeffer, Carlisle, Pa.
 A. A. Raudabaugh, New Kingston, Pa.
 Walter Rupp, Mechanicsburg, Pa., R 4.
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 Anne McCormick, 301 N. Front St., Harrisburg, Pa.
 Henry B. McCormick, Box 247, Harrisburg, Pa.
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 Morris C. Shane, Alexandria, Pa.
 H. B. Stewart, Alexandria, Pa.
 H. O. Kimmel, Shelocta, Pa.
 J. W. Warner, Co. Agt., Indiana, Pa.
 S. C. Beeman, Brookville, Pa.
 J. O. Harding, Brookville, Pa.
 Geo. Kennedy, Farm Bureau Office, Brookville, Pa.
 Dr. F. D. Pringle, Punxsutawney, Pa.
 J. P. Winslow, Co. Agt., Brookville, Pa.
 T. R. Ackeur, Mifflintown, Pa.
 E. J. Cunningham & Son, Mifflintown, Pa.
 C. A. Musser, Oakland Mills, Pa.
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 John Taylor, Cogan House, Pa.
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 Jas. W. Hunter, Grove City, Pa.
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 E. C. Deubler, Ithan, Pa.
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